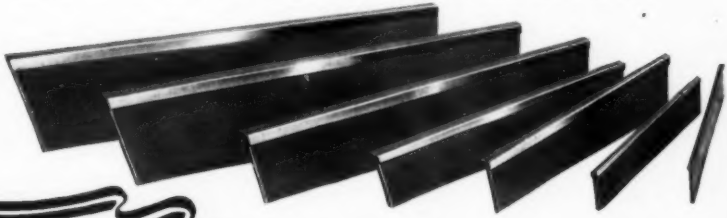
MACHINE TOOL BLUE BOOK

APRIL 1943

EMPIRE TOOL COMPANY'S

LUERS PATENTED

CUTTING-OFF BLADES



give you

- ✓ more pieces per hour
- ✓ more pieces between regrinds
- ✓ smoother finishes
- ✓ fewer regrinds
- ✓ fewer breakdowns

These Blades and Holders can be used on any of the following automatic or hand screw machines:

Acme Gridley	Libby
Bardons & Oliver	Midland
Brown and Sharpe	Millholland
Cleveland B Vertical	Morey
Cone Automatic	National Acme
Davenport	New Britain Automatics
Foster	
Gisholt	Simmons
Greenlees	South Bend
Gridleys	Warner & Swasey

Send for complete catalog

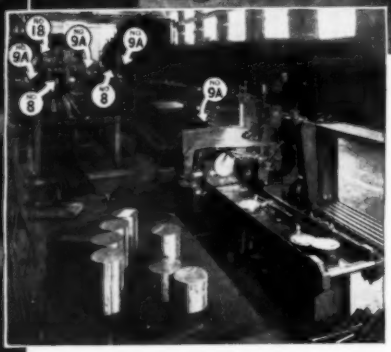
BUY WAR BONDS

Produced under License issued John Milton Luers Patents,

The Blades That

EMPIRE Tool Co.

8782 Grinnell Ave



MARVEL SAWS

help speed up War Production at the Rock Island Arsenal

● The bridge crane rolls down the bay, picks up a nest of long bars from the stock rack and lays them on the stock track of a MARVEL No. 9A. With the re-engagement of the automatic bar push-up, production is resumed and accurately cut-off lengths again begin piling up at surprising speed. Meanwhile, another 9A is automatically cutting-off great slices from the 10-inch diameter bar. Down the bay, still other No. 9As are rapidly reducing long bars to accurately measured pieces. A second glance at the giant MARVEL No. 18 Hydraulic shows it to be already deep in the large billet which was just moved into position, while nearby, two MARVEL No. 8 Metal-Cutting Band Saws are busy making a great variety of miscellaneous cuts in stock of all sizes and shapes.

There is a different atmosphere in the MARVEL equipped cutting-off department . . . none of the endless "plugging along" that one used to associate with hack sawing. Instead, smooth running high-speed production . . . real output with modern high speed, all ball-bearing equipment. Because no other accurate cutting-off method can equal MARVEL SAWS in speed, dependability, or low cost per piece, they are being widely used in speeding up American war production.

ARMSTRONG-BLUM MFG. CO.

"The Hack Saw People"

5700 BLOOMINGDALE AVE. CHICAGO, U. S. A.

Eastern Sales Office: 225 Lafayette St., New York

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long life welder construction is important these busy days.

Dependability has long been a leadi
praise among Hobart users. But Hob
expects that, for every ounce of eve
welder is built with the word quali
stamped on it. That's why these m
chines can stand up and fight all d
long, one shift to another, without lettin
you down. The modern, all-welded, co
pact, balanced design of the Hob
welder, with its remote control featu
plays a big part in your productio
battle. So, when there's no time to
puttering around fixin' up welders, you
be on the safe side if YOUR welde
are Hobarts!

HOBART BROS. CO., Box TB-43 Troy, O

7 POINTS to consider in your choice of an arc welder...

HOBART "Simplified" ARC WELDERS

with the exclusive and original REMOTE CONTROL

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"One ... the World's Largest ... of Electric Arc Welde

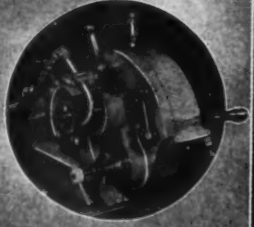
RIVETT

104 INT.-EXT. GRINDER

For Small Hole, Cylindrical and Concentric Grinding

104 INT.-EXT. GRINDER

External Spindle and Tailstock



Internal and External Spindles in Turret

SPECIFICATIONS

Grinding cap., hole dia.	up to 2"
Grinding cap., outside dia.	up to 3"
Automatic table travel	
Standard	¼" to 2"
Special	⅛" to 4"
Hand table travel	11"
Swing over table	15"
Center distance	8"
Workhead swivel	90°
Table swivel	3°
Cross feed graduations	
Standard	.0005"
Special	.0001"
Travel of cross slide	14"
Collet capacity	½"
Step chuck capacity	6"
Jaw chuck capacity	6"
Workhead spindle speeds	
	500, 275 rpm optional
Grinding spindle speeds	
Standard int. 21000 and 15000 r.p.m.	
External	3600 r.p.m.
Net weight with motor	1750 lbs.

For Further Description Write for Bulletin 104

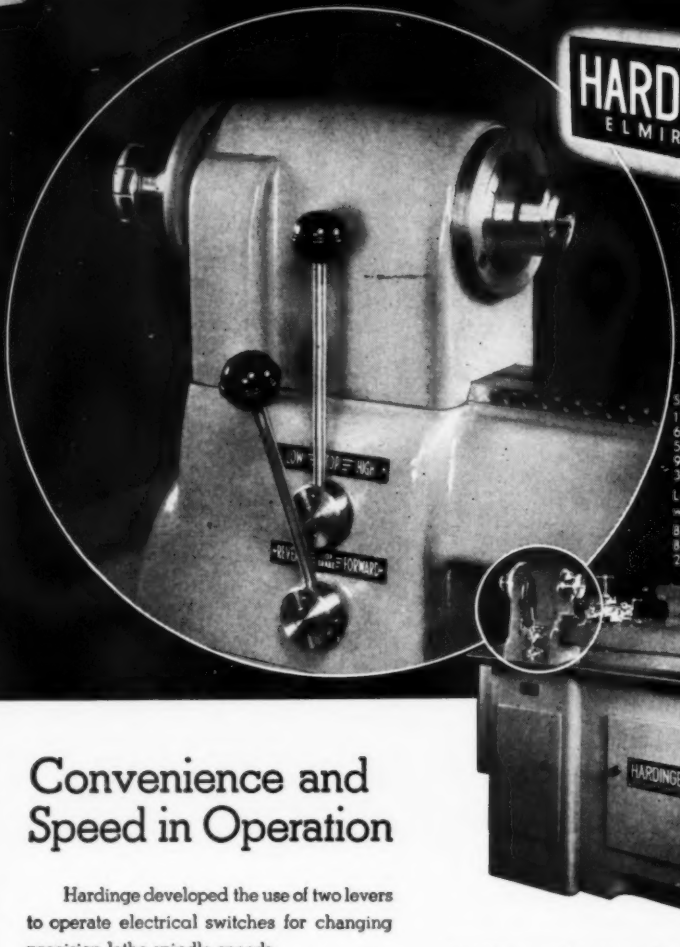
PM NAVY

The Rivett No. 104 is a simple, accurate grinder [illegible] tool making as well as precision [illegible] up and operation and [illegible] machine [illegible] al or [illegible] e selec- [illegible] pecial [illegible] grinding of internal and external surfaces at one chucking, turret carrying both internal and external spindles may be used.

RIVETT LATHE & GRINDER INC.

BRIGHTON, BOSTON, MASS.

PIONEERS IN BENCH LATHE DEVELOPMENT



Convenience and Speed in Operation

Hardinge developed the use of two levers to operate electrical switches for changing precision lathe spindle speeds.

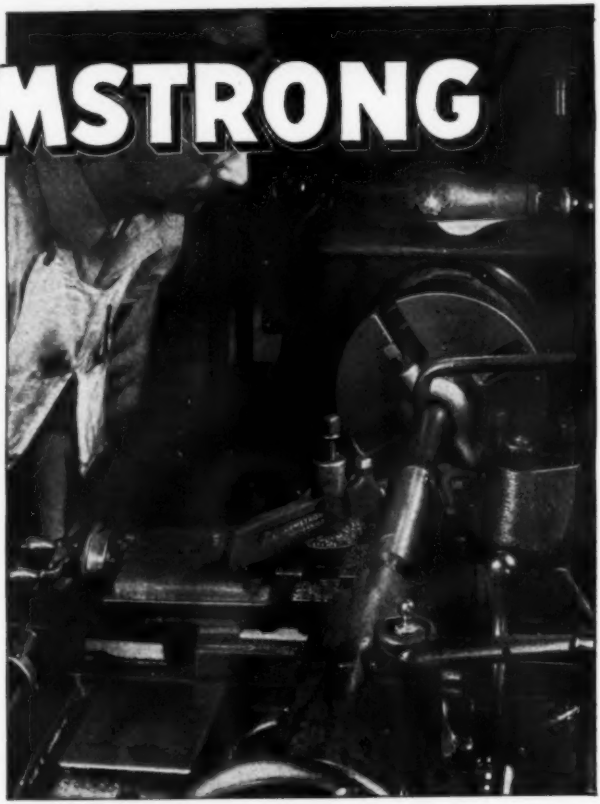
As illustrated, each lever has two speed positions only. The operation of each lever to a speed position is to a definite location. This means *convenience and speed* as the operator can concentrate his attention on the work. Concentration on work results in greater production and better workmanship.

Consideration of every detail characterizes HARDINGE machine design.

HARDINGE BROTHERS, Inc., ELMIRA, N. Y

"PERFORMANCE HAS ESTABLISHED LEADERSHIP FOR HARDINGE"

ARMSTRONG



The Aviation Industry has been built on modern steels, modern standards and MODERN TOOLS

A creation of modern times and forward-looking men, the Aviation Industry has probably the finest equipped shops and tool rooms in the world. It is significant that throughout "Aviation," ARMSTRONG TOOL HOLDERS are standard equipment. In the Armstrong System Aviation has found dependable, efficient tools for every operation on lathes, planers, slotters and shapers—modern ARMSTRONG TOOL HOLDERS that "Save: All Forging, 70% Grinding and 90% High Speed Steel"; that easily handle modern tough alloy steels at modern cutting speeds; that are always ready for work without expensive delays for tooling up.

With today's tremendous demands, close scheduling, where even minutes are expensive, requires dependable tools of absolutely certain performance—and Aviation has found the answer in ARMSTRONG TOOL HOLDERS.

ARMSTRONG BROS. TOOL CO. "The Tool Holder People"

308 N. FRANCISCO AVE., CHICAGO, U. S. A.

Eastern Warehouse and Sales: 199 Lafayette St., New York

Machine Tool Blue Book

Hitchcock Publishing Co., 542 So. Dearborn St., Chicago

Published Monthly *Volume 39, No. 4*

APRIL 1943

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For you manufacturers, both small and large, who are worried over uncertain delivery promises on your Male Thread Gages, why not let us quote on your gage requirements today, because we carry 75% of standards in stock ready for delivery.

A combination of a new plant, modern equipment and experienced workmen has made it possible for PERFEX to make this 48-hour delivery promise of 75% of standard male thread gages.

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There is a 3 to 5-week delivery promise on all other PERFEX standard size gages. For a complete description of our gage line wire or write our sales department today!

PERFEX'S 4 Pitch Left-Hand Thread Gage.

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ACCURACY PERFEX OUR CREED

PERFEX GAGE and TOOL CO.

3605 GAYLORD DETROIT, MICHIGAN

Incredible Uncle Ishmael

...the one-man army!

UNCLE ISH is the derndest feller. He paid 4½ cents for that weapon, and he can shoot a clay pipe right out of your mouth at 100 yards. What's more, he's a one-man army. . . . Incredible? Well, here are the facts:

The famous Robbins & Lawrence and E. G. Lamson companies, ancestors of Jones & Lamson, had working for them in the 1800's two of the finest gunsmiths in the world. They were Albert Ball and Benjamin Tyler Henry, and the genius of these two men contributed much to the invention of a gun that was destined to make history.

That gun is known throughout the world today as the famous Winchester rifle — but in an earlier form, as the Ball lever-action repeater, it was known only as a headache to E. G. Lamson & Co. For there was a large order from the government for this revolutionary firearm, to replace the muzzle-loaders being used in the Civil War, but the war ended before delivery could be made.

The result: Hundreds of these repeating rifles were put up for sale at one-half cent a pound—and Uncle Ishmael got one. Nine pounds of the greatest gun in the world, for 4½ cents!

Later, when the patent for Ball's lever-action magazine was purchased and combined with improvements in rifle design made by Henry and another gunsmith named King, the great Winchester rifle was born. And it was an early advertisement for this rifle that told how Uncle Ishmael was a one-man army. "A man armed with one of these rifles," it read, "can load and discharge one shot every second, so that he is equal to a company every minute, a regiment every ten minutes, a brigade every half-hour, and a division every hour!"

The company in which that famous firearm had its origin is known today as Jones & Lamson, and the gun is typical of many great American products that have stemmed from the tools — and the men — developed by this company.

Jones & Lamson engineers and service men are at your call today . . . right now . . . to help you in solving the difficult problems of present and post-war readjustment.

JONES & LAMSON
Machine Company
SPRINGFIELD, VERMONT, U. S. A.
Profit-producing Machine Tools

Manufacturers of Ram & Saddle Type Universal Turret Lathes . . . Fay Automatic Lathes . . . Automatic Thread Grinding Machines . . . Comparators . . . Automatic Opening Threading Dies and Chasers.

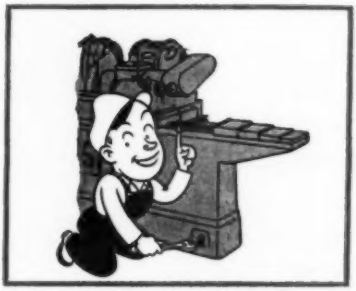
POINTERS

ON KEEPING YOUR CINCINNATI PLAIN GRINDER RUNNING . . . LONGER . . . MORE EFFICIENTLY

CINCINNATI

CINCINNATI 10" Plain Hydraulic Grinding Machine. Advantages and engineering specifications fully covered in catalog G-490. Copies available at no obligation whatever.

Remove collet at least once a month and clean drain hole and slinger grooves.



Check level of machine periodically, and re-level if necessary. How often depends upon type of foundation. Check after first month of operation.

THE CINCINNATI MILLING MACHINE CO.

TOOL ROOM AND MANUFACTURING MILLING MACHINES . . . SURFACE BROACHING MACHINES . . . CUTTER SHARPENING

A SIMPLE, easy-to-follow routine and common-sense precautions will do much to keep your machine tools running longer . . . more efficiently. Here are a few pointers for CINCINNATI 10" Plain Hydraulic Grinding Machines:

1. Lubricate your machine daily, using oil of the recommended specifications. Change oil as recommended; oftener if shop is dusty or if machine is operating three shifts. Lubrication schedule tag tied to machine will help.
2. Change replaceable filters and clean spindle oil filter when changing oil. New filters are cheap insurance against machine breakdown.
3. Accurate work tolerances require periodic releveling of the machine. Foundations are rarely stable enough to maintain the accuracy of initial leveling.
4. High grade finishes require clean coolant. Remove sludge from coolant reservoir once or twice a week.
5. When changing wheels, remove collet and clean out drain hole. This simple precaution will keep coolant out of spindle oil.
6. Use handwheel retraction of footstock center for heavy work and when removing stock rapidly. Don't take a chance on work jumping out of machine.

Follow printed instructions in lubricating your machine. An oil schedule tied to the machine will help, and a central lubricaion department will do a better job.

Item No. 1 — the most important factor of longevity and high efficiency in machine tools —is fully covered by our lubrication booklet, No. M-1084-2. Copies available on request.

CINCINNATI GRINDERS INCORPORATED CINCINNATI OHIO U.S.A.

MACHINES . . CENTERTYPE GRINDING MACHINES . . CENTERLESS GRINDING MACHINES . . CENTERLESS LAPPING MACHINES

(Below) Some of the parts turned on Sundstrand Automatic Lathes

(Left) One machine used for roughing, while the other finish turns. One man operates both machines on short run work.

(Left) Rough gear blank; rough turned part and finish turned part.

Production Increased 9 Times ON SHORT RUN TURNING

LOTS OF 25 TO 100 PIECES TURNED FASTER ON SUNDSTRAND AUTOMATIC LATHES WITH QUICK CYCLE CHANGE

Here's maximum production on short run turning. On one, of approximately 100 odd turning jobs, the time was cut from 45 to 5 minutes.

PARTS TURNED include cast-iron, steel and bronze. Simple gear blanks, sprockets, sleeves, etc., are all turned on two Model 10 Sundstrand automatic lathes.

SET-UP TIME is less than 45 minutes. Roughing and Finishing are done simultaneously and completed in 5 minutes. Lot size is 30 parts. Set-up time for each machine is less than 45 minutes.

A WIDE RANGE of action for front carriage tools is provided by three units which can be used separately or in combination to give (1) Angular feed-in and tool relief. (2) Slow-up and dwell. (3) Straight feed-in and tool relief. Many combinations are possible by making simple adjustments.

uick set-up for short ns is accomplished adjusting dogs on a aduated disk. Cycles e rapid approach, ed and quick return 250" per minute. o cycle control cams e required.

SUNDSTRAND SIMPLE CYCLE CONTROL makes possible quicker set-up and easy change-over. It provides complete control of all cycles by simple adjustment of dogs on a disk...cams are eliminated. Six dogs control all cycles. Rapid return is 250" per minute.

LET SUNDSTRAND ENGINEERED PRODUCTION HELP YOU

Our engineers are available to study and make recommendations on a productive machining sequence. They are at your service without obligation.

HOW TO TURN SHORT RUN WORK FASTER...

illustrated in this 16-page book describing Sundstrand Automatic Lathes. Set-up and change-over features are described. Write for Bulletin 411.

SUNDSTRAND MACHINE TOOL CO.

HOBBING WORM GEARS

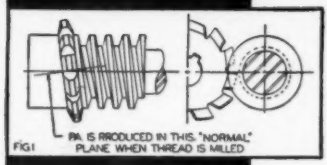


FIG.1

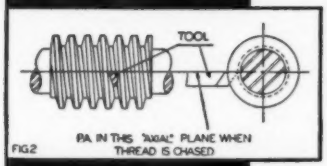


FIG.2

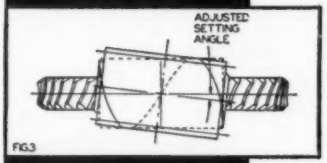


FIG.3

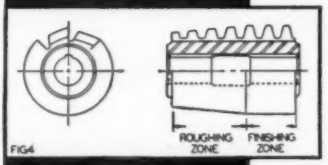
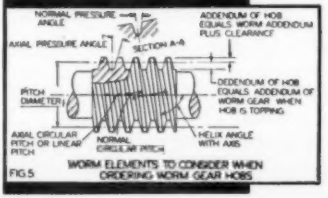


FIG.4


NORMAL PRESSURE ANGLE
AXIAL PRESSURE ANGLE
SECTION A-A
ADDENDUM OF HOB EQUALS WORM ADDENDUM PLUS CLEARANCE
DEDENDUM OF HOB EQUALS ADDENDUM OF WORM GEAR WHEN HOB IS TOPPING
PITCH DIAMETER
AXIAL CIRCULAR PITCH OR LINEAR PITCH
NORMAL CIRCULAR PITCH
HELIX ANGLE WITH AXIS
WORM ELEMENTS TO CONSIDER WHEN ORDERING WORM GEAR HOBS
FIG.5

You can save time in securing the right tools for your specific job; you can increase cutter life and reduce tool cost; and you can get a better job by observing a few simple fundamentals.

GENERATING METHODS FOR WORMS

1. THREAD MILLING: Remember that a 29° angle on the cutter will produce a 14½° pressure angle in the *normal* plane (Fig. 1).
2. THREAD CHASING: This method with a 29° tool produces worms with a 14½° pressure angle in the *axial* plane (Fig. 2).
3. HOBBING: A hob with a 29° tooth in the normal plane produces a worm with a 29° tooth or a 14½° P.A. in the *normal* plane.

INFEED HOBBING OF GEARS

1. To provide tool life, infeed hobs should be made oversize to allow for sharpening.
2. The greater the amount of oversize the less the bearing area on the gear.
3. When an oversize hob is used it should be set slightly off 90° in the hobbing machine to avoid a 'crossed' bearing. The amount depends on amount of oversize (Fig. 3).
4. Once the pitch diameter is less than that of the worm, the hob will produce a pinched bearing, making it useless.

TANGENTIAL FEED HOBBING

1. Best suited to production of accurate worm gears (Fig. 4), because it operates at exact center distance with less tendency toward "destroying" action in the cutting.
2. Less oversize required than for infeed hobs, thereby permitting setting to more nearly correct angle on machine when hob is new.

WHEN ORDERING

When ordering hobs always include a print of the worm and gear and indicate rotation and direction of feed of the hobbing machine. Specify whether pressure angle of the worm is in the normal or axial plane. Always give *pitch diameter* of worm. This will insure your getting the right kind of a hob for your job (Fig. 5).

If you do not already have a copy, send for a practical booklet for shop and tool design department use. Ask for "Hobbing" booklet No. 149-A.

MICHIGAN TOOL COMPANY

7171 E. McNICHOLS RD. • DETROIT, MICH., U. S. A.

NEW *Precision* AUTOMATIC
Solves Tough Jobs Like These . . .

Product of Two Names Famous for *Precision*

The Original Swiss **PETERMANN** Model P-7

Re-engineered by **GORTON** Improved - Modernized

GORTON ANNOUNCES a new, more versatile Precision Automatic—the Model 16-A Screw Machine. Built to meet America's emergency and post-war critical needs for mass production of extremely small, intricate parts. Long, slender pieces—multiple diameters are finely finished to closer tolerances, in one operation. Unique design offers almost limitless scope in generating any shapes. Present deliveries, 6 to 8 weeks.

THE ONLY SWISS AUTOMATIC BUILT IN U.S. UNDER PETERMANN LICENSE

Exclusive manufacturing rights have been granted to Gorton by S. A. Joseph Petermann, Moutier, Switzerland, through their U. S. distributors, Russell, Holbrook & Henderson.

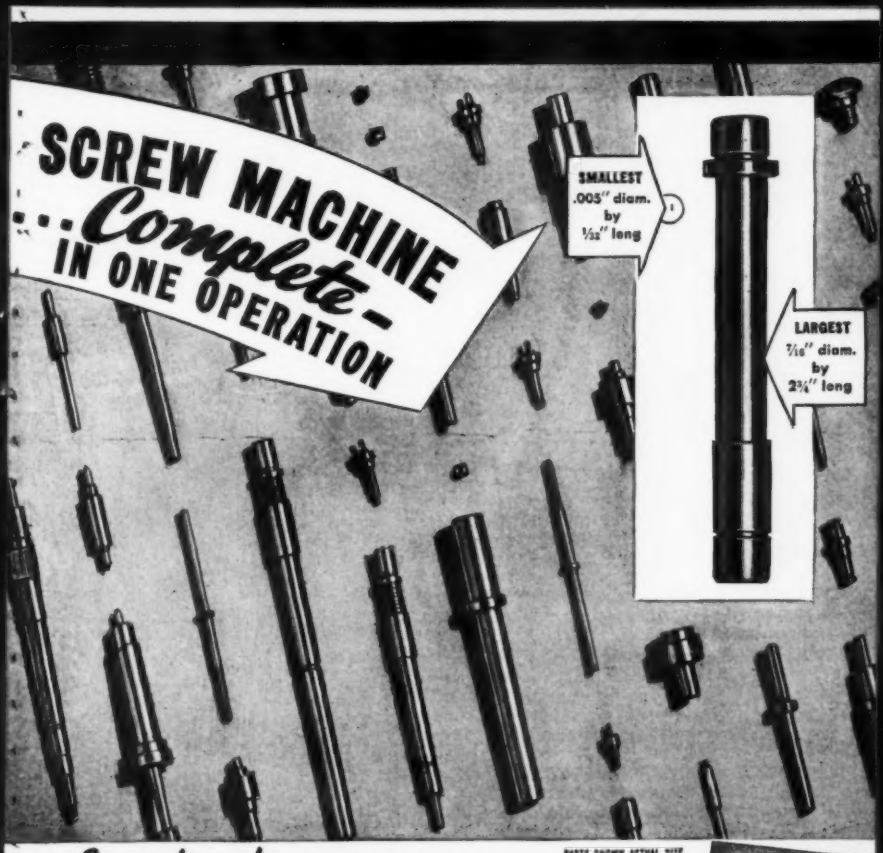
Gorton 16-A retains all the famous features of the Petermann P-7, with complete re-engineering by Gorton, adding further improvements and refinements.

ARMY E NAVY

OUR GOLDEN ANNIVERSARY
1893-1943

GORTON
50 YEARS OF PRECISION TOOLS

GEORGE GORTON
1317 RACINE STREET
SPECIALISTS FOR 50 YEARS IN REPRODUCING FROM MASTERS



Exceptional ACCURACY AND QUALITY OF FINISH

High diametrical accuracy—work rigidly supported at point of cutting tool load. Unusually high finish—grinding often eliminated.

LOW TOOL AND OPERATING COST...

Maximum accessibility for quick set-ups. Uses only standard single point tool bits. Micrometer adjustments on every tool. Centralized controls—infinitely variable speeds and cam feeds at touch of dials.

LONG LIFE OF PRECISION PERFORMANCE...

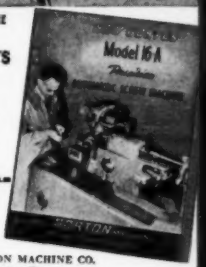
Slow movements—short stroke—freedom from vibration.

COMPLETE TOOLING SERVICE... No charge or obligation.

PARTS SHOWN ACTUAL SIZE

GET THE FACTS NOW

Send Coupon Today for **FREE** Bulletin



MAIL TODAY

GEORGE GORTON MACHINE CO.
1417 Racine St., Racine, Wis.

Send me immediately, complete information with **FREE** bulletin of specifications and data covering the new Gorton Model 16-A Precision Automatic Screw Machine. No obligation, of course.

Name..... Title.....

Company.....

Address.....

City..... State.....

MACHINE CO.

RACINE, WIS., U. S. A.

ENGRAVING, DIE MAKING, VERTICAL MILLING MACHINES

Accuracy of ±.0001" with Extremely High Finish

Maintained in Precision Boring Connecting Rod Bearings on a

STOKERUNIT SIMPLEX *Precision* BORING MACHINE

(Left) Steel Forged Connecting Rod with Babbitt Main Bearing, Bronze Wrist Pin Bushing.

ACTUAL BORING TIME EACH 32 SECONDS COMPLETE

(Right) The two ends alternate in boring cycle, each end boring wrist pin and main bearing at same time.

(Below) Two operators maintain production of 70 connecting rods per hour.

This manufacturer bores both wrist pin and main bearings in connecting rods simultaneously on a No. 2U Stokerunit Simplex 2-Way 4-Spindle Precision Boring Machine. The two ends of the machine alternate in the roughing and finishing operations.

FIRST SPINDLE—Rough boring babbitt bearing; stock removal 1/32". Also facing and chamfering one side of bearing.

SECOND SPINDLE—Finish boring wrist pin end of rod in steel forging (230 Brinell); stock removal .010". Bore is .875" dia. by 1" long.

At this point, one operator removes rod and presses in bronze bushing, while other operator loads machine for initial operations.

THIRD SPINDLE—Finish boring babbitt bearing; stock removal .005". Bore is 1.752" dia. by 1⅛" long. Also facing and chamfering other side of bearing.

FOURTH SPINDLE—Finish boring bronze bushing on wrist pin end of rod; stock removal .004". Bore is .750" dia. by 1" long.

One operator now removes completed rod and loads other end of machine for final operations.

PRECISION ACCURACY...SUPERIOR FINISH

Tolerances of ±.0001" *and better* are held in production. Total actual boring time is 32 seconds per rod in all boring operations. Spindle speed 2600 r.p.m.; feed .002" per rev. Total floor-to-floor time 70 pieces per hour.

OVER 25 MODELS of Stokerunit Simplex Precision Boring Machines are available in mechanical and hydraulic feeds, with single or multiple spindles, for short-run or production work. Among them you will find the model which will solve your precision boring problems.

For complete details and specific recommendations, send prints of parts with production requirements. No obligation.

WRITE TODAY for booklets covering Simplex Precision Boring Machines. Full details and specifications are included.

STOKERUNIT CORPORATION

DESIGNERS AND BUILDERS OF PRECISION BORING MACHINES AND MILLING MACHINES

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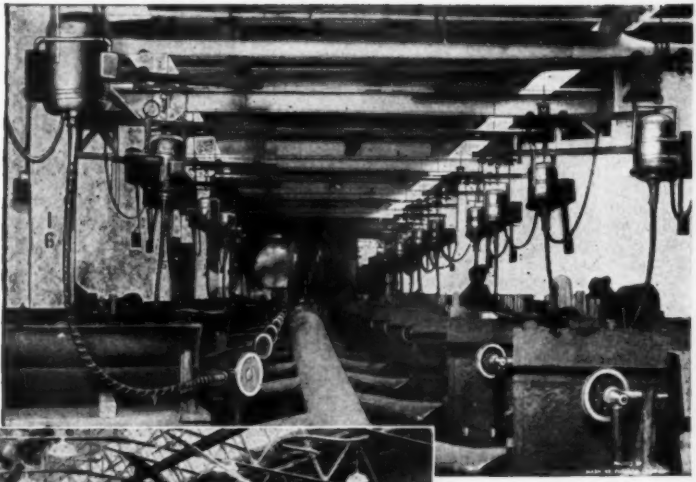

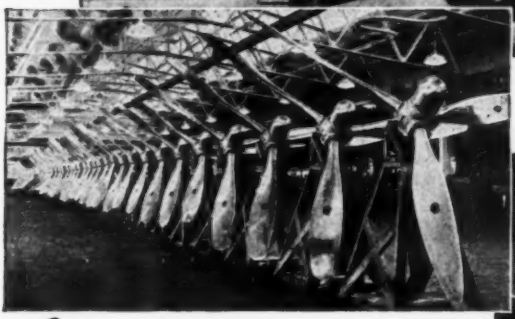

Jarvis POWER TOOLS

Hundreds of these Jarvis Propeller Sanding, Polishing and Buffing Machines are working around the clock. They speed the production of aircraft propellers in all the leading propeller plants of the Nation.

THE CHARLES L. JARVIS CO., MIDDLETOWN, CONN.

TAPPING ATTACHMENTS • FLEXIBLE SHAFT MACHINES • GROUND ROTARY FILES

Turning out essential munition parts at Alfred Stauffer Machine Shop, Honey Brook, Penna.

ROGERS "Perfect 36" VERTICAL TURRET MILLS *in action*

● Modern design and universal adaptability have won a place for Rogers "Perfect 36" Vertical Turret Mills in war production throughout the United Nations.

Quicker set-ups . . . more finished work per hour per mill . . . and closer tolerances are the direct results of level chuck and *adjustable main and special swivel side heads.*

Remember, Rogers Vertical Turret Mills will be as versatile in tomorrow's peace-time production as they are today in turning out urgent war production.

Call on Rogers today or tomorrow.

QUICK DELIVERY AT SURPRISINGLY LOW PRICES

for

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ROGERS MACHINE WORKS, INC.

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Hardy-Light Compact

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PUSH-TITE
AIR HOSE COUPLINGS *and* HOSE CLAMPS

Hansen PUSH-TITE Air Hose Couplings and hose clamps are the choice of the field, because they are light, rugged and compact, operate much easier and faster and last considerably longer. Slight push of plug into socket—coupling is connected, air is automatically turned on, easy pull on sleeve—it is disconnected and air is automatically turned off; absolutely leak-proof at pressures up to 14,000 pounds.

Hansen hose clamps, unlike ordinary clamps grip on the outside as well as inside of hose—a 2 to 1 advantage. Easy to install, neat and trim and can be used many times over. Send for free catalog.

Hansen MFG. CO.

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TECO CARBIDE TOOLS

hold the "edge"-

for *high speed* TURNING, BORING and FACING

MOST carbide tools look alike because they are made to similar standard shapes and sizes. But once they get on your machines, production tells a different story . . . a difference based upon the quality of the carbide itself.

Rigidly controlled hardness, density and uniformity enable TECO Carbides to hold cutting edges and maintain accurate tolerances for longer runs, producing more pieces between grinds. You reduce waste time for retooling, getting more productive hours out of your machines.

Try a run with TECO Carbide Tools and let the results speak for themselves. All standard styles, sizes and grades for most machining needs. Send details of your requirements.

TUNGSTEN ELECTRIC CORPORATION • 565 39th St., Union City, N. J.

Branch Office: 2906 Euclid Avenue, Cleveland, Ohio
Representative: Architects and Builders Bldg., Indianapolis, Ind.

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NEW TECO CATALOG

Give specifications of all standard TECO Carbide Tools and Blanks for turning, boring, facing and cut-off operations. Write today.

TECO *Pioneers in Tungsten Carbides for over a Quarter Century* **CARBIDE TOOLS**

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We Can Ship Today!

Sheffield has a complete stock of AGD Adjustable Snap Gages in all models and in all ranges —for immediate shipment.

Every one of these gages has been made to Sheffield's high standards of quality in both materials and precision workmanship.

When Ordering, Be Sure to Give All the Following Information:

State Frame Model and Frame Size. Stipulate whether gage is to be set and sealed (allow additional day on orders for set and sealed gages). Give complete marking instructions if set and sealed.

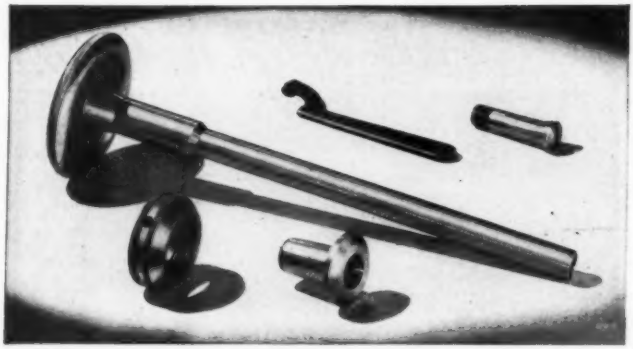
FOR SPECIFICATIONS SEE SHEFFIELD HANDBOOK No. 42-2 PAGES 150-153

THE **SHEFFIELD** CORPORATION
DAYTON, OHIO, U. S. A.

SHEFFIELD GAGES

Handwheel Draw-in Collet Attachment

FOR CHUCKING PRECISION SMALL DIAMETER WORK



The most precise of all types of chucks. Unmatched for small diameter precision work, particularly the manufacture of small tools and parts. This draw-in collet chuck attachment consists of one-piece steel handle and draw-bar; nose-piece (1½"—8 thread); sleeve of tool steel hardened and ground for wear and accuracy; and spanner wrench. Fits the 10" Atlas, 9" So. Bend Workshop and 10" Logan Lathes. Less collet, $25.00 FOB, N. Y.

1/16" to ½" round collets sized in 8ths, 16ths, and 32nds—3C Hardinge and 3SB Rivett collets. (When ordering, state hole size of collet desired.) Each, $3.75 FOB, N. Y.

IMMEDIATE DELIVERY

Attachments for other makes of bench lathes available from factory stock. Specify manufacturer and the serial number. Prompt attention to your order assures reasonable delivery.

CENTER TOOL *Machine Shop Equipment* **CO. 153 CENTRE STREET, N.Y.**

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HYDRAULIC

INTERNAL GRINDER

Embodying features not to be found in any other one machine will be announced soon...

See May Issue

of this publication for further information

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Machine Tool Division

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SCHERR
DIAL TEST INDICATOR

Simple in construction— Durable and Guaranteed for Accuracy...

Available with universal back having ball joint which permits wide range of indicator settings. Can be clamped in any position.

SPECIFICATIONS — Diameter of housing—2". Thickness—⅞". Stem diameter—.275". Plunger travel — ⅜". Dial graduated in 1/1000"—0-50-0.

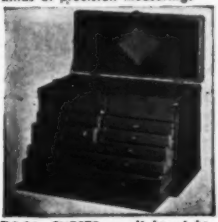
This improved instrument, developed by specialists in precision measuring, offers unique features which assure greater accuracy, minimize friction and reduce the chance of error. Simple in construction, with but three moving parts, the GS Dial Test Indicator can be depended on for long service and maintained accuracy. Features include:

- **...rotating adjustable dial for zero setting with positive lock nut.**
- **...case and plunger housing machined in one piece from nickel silver casting.**
- **...movement mounted between separate top and bottom plate.**
- **...dustproof case and rustproof mechanism.**
- **...non-breakable crystal. Set with Attachments, $18.00.**

Write for illustrated bulletin giving detailed information on the Scherr Dial Test Indicator. Write, wire or telephone (Canal 6-3512) for quotations and delivery dates.

REED MICROMETERS assure accuracy over full range of screw. Easy to read, smooth and sensitive. 901 Tenths $10.25 List.

MACHINISTS' TOOLS—available in a wide range of types for all kinds of precision measuring.



TOOL CHESTS — lightweight, strong and durable; separate locks for open top and drawer sections. #720 Oak $13.50 Net.

Grinding Room Specialties

MAGNE-BLOX laminated magnetic parallels and V blocks for holding work that cannot be placed directly on magnetic chuck. $14.50.

"LITTLE WONDER" RADIUS DRESSER—makes possible fast and accurate dressing of convex or concave wheels from 0 to 1" without removing wheel guard. $46.00.

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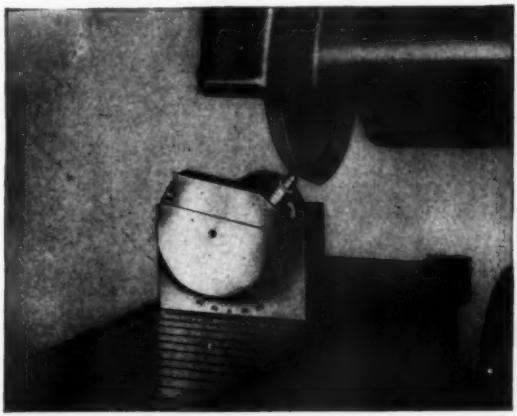
Welch
QUICK ANGLE DRESSER



"QUICK" TO SET FOR DRESSING
THE GRINDING WHEEL TO ANY DESIRED ANGLE

That is one of the outstanding features of the Welch Quick Angle Dresser That has made such an appeal to engineers and operators.

OTHER MARKED ADVANTAGES

The Welch Quick Angle Dresser is small, compact and durable. It is simple in design and construction. All surfaces are hardened and ground. Furnished in Plain or Vernier type. Plain Dresser graduated in degrees on revolving dial. Vernier type reads in degrees and minutes. An unusually serviceable tool and a material aid in today's demand for increased production.

10 DAYS FREE TRIAL IF DESIRED

PLAIN TYPE
$70. NET

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VERNIER TYPE
$82.50 NET

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Makers of High Speed Milling Cutters—Form Tools and Special Tools

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Air operated equipment works best at the correct pressure for each job, and many times the right working pressure is far less than full line pressure. Hannifin pressure regulating valves give you the most efficient working pressure with a turn of the adjusting screw. The exclusive piston-type design means sensitive, accurate control, and full-scale adjustment over the entire range from 150 lbs. down, to furnish any reduced operating pressure desired. Long valve stem travel gives large volumetric capacity, responding to varying operating needs with minimum restriction to flow. Hannifin pressure regulating valves are built in three standard sizes—⅜, ½, ¾ inch for use with initial compressed air pressures up to 150 lbs. Furnished complete with pressure gauge. Write for Bulletin 56-H.

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HANNIFIN *pressure regulating* **VALVES**

A Putnam Spiral Fluted Chucking Reamer

is the tool for any reaming job that requires maximum cutting speed combined with greatest accuracy.

And because of the spiral—an exclusive Putnam design—chips do not jam and scratch the finish even when reaming the deepest holes.

CHECK SPINDLE ALIGNMENT CAREFULLY

The best reamer cannot produce a straight accurate hole if the machine spindle is worn and out of alignment. For the best results from your reamers check spindle alignment frequently.

ARMY E NAVY

PUTNAM TOOL COMPANY

2983 Charlevoix Avenue • Detroit, Michigan

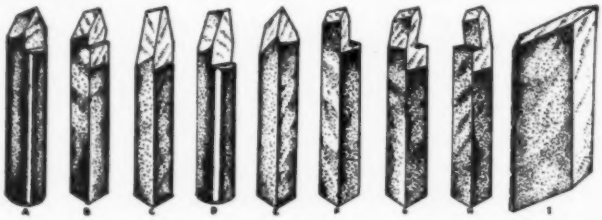
Announcing A Truly Universal

LOW COST
THREAD TOOL GRINDING FIXTURE

MODEL A 600-290

NOW Through the development of the WILCO THREAD TOOL GRINDING FIXTURE, you can easily and speedily grind both 60° and Acme 29° thread tool bits to extreme accuracy with the same tool. Correct side clearance is provided for, and all bits may be ground with or without rake on the cutting face. Present day precision thread cutting requirements make this tool indispensable in every machine shop, tool room and production plant.

The Wilco Thread Tool Grinding Fixture may be used on any surface grinder or cutter grinder. A magnetic chuck for holding the fixture is convenient but not necessary, since it may be easily clamped to the work table. The special tool bit holder will securely hold round or square tool bits in all sizes from 1/8" to 5/8".



Illustrations above are typical of the many styles and types of thread cutting tools which are quickly ground with the Wilco Fixture. Tools G and H are ground with right and left hand adaptors which are furnished as standard equipment. Tool E is ground for use in tool holders having a 15° slope in the holder channel, such as Armstrong, etc. Chaser blade I is ground with the use of a special holder which we can furnish on special order.

Write for additional information, or order sample for trial in your own shop. Prompt deliveries.

Price of the Model A 60° and 29° combination, complete with right and left hand adaptors, **$16.75.**

Manufactured by

H. C. WILSON

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A "Jewel" for FAST HARD WORK

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RED BAND
DIAMOND TOOLS

Third Generation of Diamond Experience

ABRASIVE DRESSING TOOL COMPANY DETROIT

Write for catalog showing prices and specifications

1

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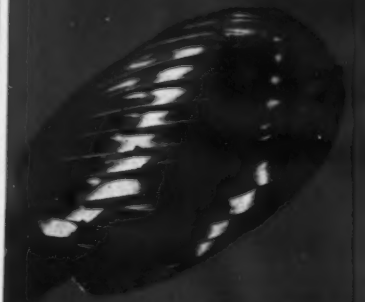

3

SALVAGE YOUR DULL, WORN *rotary files*

CONVERT THEM INTO SHARP MIDGET MILLING CUTTERS

There's good tool steel in those old, worn rotary files in your plant. In fact it's so good that we can convert dull rotary files into perfect Midget Milling Cutters. The cost to you is 65% off list of Severance new-tool price. SO NOW IS THE TIME TO HELP SALVAGE AMERICA'S PRECIOUS SUPPLY OF TOOL STEEL. Send us your dulled rotary files to have us regrind them into hard-biting, sharp-cutting Midget Milling Cutters.

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NEW SEVERANCE MIDGET MILLING CUTTERS

Standard finishing tools for every type of metal and alloy, wood and plastic are being made today by Severance to help speed up your production. Inside and outside deburring cutters, chatterless countersinks, chatterless seating and facing cutters, electrode dressing cutters, reamers and special tools of every type are available. Write for complete information on all standard Severance Midget Milling Cutters and special tools.

Severance

MIDGET MILLING CUTTERS • PRECISION REGRINDING
SEVERANCE TOOL INDUSTRIES, INC., SAGINAW, MICH. •
PLANTS IN LONG ISLAND CITY, N.Y.; DETROIT, MICH.;
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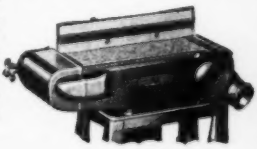
A Practical Solution for many Finishing Problems

There are dozens of sanding, polishing and finishing operations for which this machine is ideal. Its advanced design permits quick, accurate adjustments for a large variety of jobs. It is light enough to be easily moved around to just where you need it. Its price is surprisingly low.

DELTA ABRASIVE FINISHING MACHINES

The frame is heavy and substantial; the adjustments are convenient and positive in action; attachments are quickly attached or removed; the machine may be used either vertically or horizontally, as required. Adjustable fence for edge sanding and adjustable back stop for flat sanding are available for use in horizontal position. Entire machine is completely enclosed and guarded in accordance with all safety requirements. Dust removal may be made efficiently. It is completely ball - bearing equipped with double-seal bearings, lubricated at the factory for life.



SEND FOR NEW CATALOG

giving full details and prices on Delta Abrasive Finishing Machines and other Delta low-cost machine tools. Get in touch with nearest Delta Industrial Distributor or send coupon below.

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Please send me Catalog giving full details and prices on Delta Abrasive Finishing Machines, and your full line of low cost machine tools.

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Procunier Tapping Machines are designed to permit unskilled men and women workers to tap like experts. Actual production records show that "green" help get more accurate tapping, faster with less tap breakage — when they use Procunier Machines. Here's why: The extra-long spiral compensating springs, with wide range of hand screw adjustments, maintain pre-set tap feeding and reversing pressure INDEPENDENT OF THE OPERATOR! Other Procunier features that step up your tapping output are: 1. The improved Procunier tapping head with double-cone cork-face friction clutch; 2. Four speeds, ranging from 390 to 2050 RPM efficiently handle jobs for which conventional high speed tapping machines are inadequate; 3. One machine handles tap sizes from No. 2 to ½" through two interchangeable heads.

Tap Establishes Its Own Lead

The new Procunier Universal Tapping Machine is exclusively designed so that it actually allows the tap to establish its own lead. There is nothing more accurate than a precision ground thread tap as a guide for tapping—so maximum tapping efficiency is attained where an accurate tap is free to establish its own lead in cutting the thread.

SEND FOR CATALOG giving full details, description and prices on the full line of Procunier Universal Tapping Machines, hand or foot operated, the complete line of Procunier Precision Tapping Heads to meet all needs and the new Tru-Grip Tap Holder.

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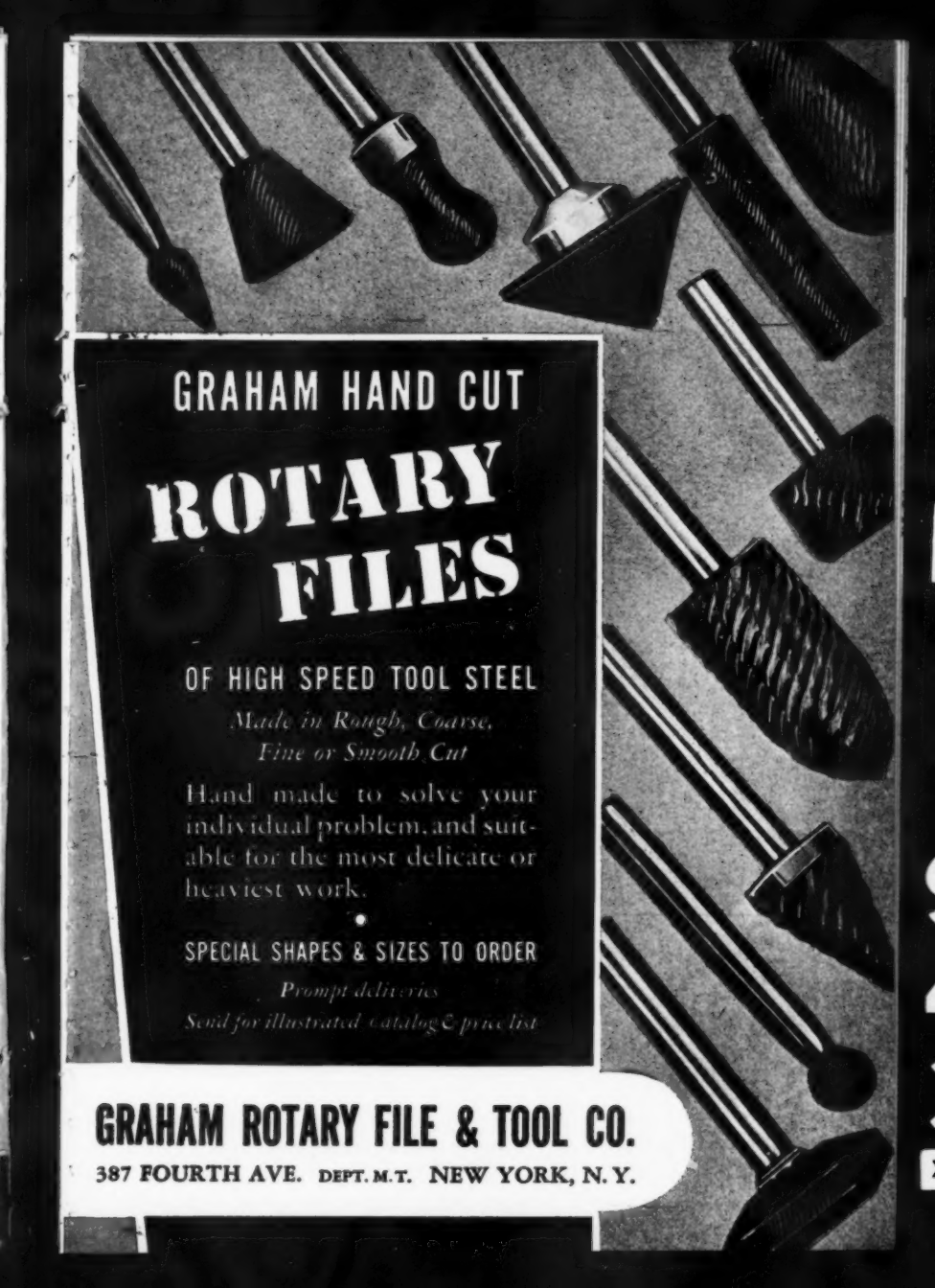
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ROTARY FILES
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Prompt deliveries
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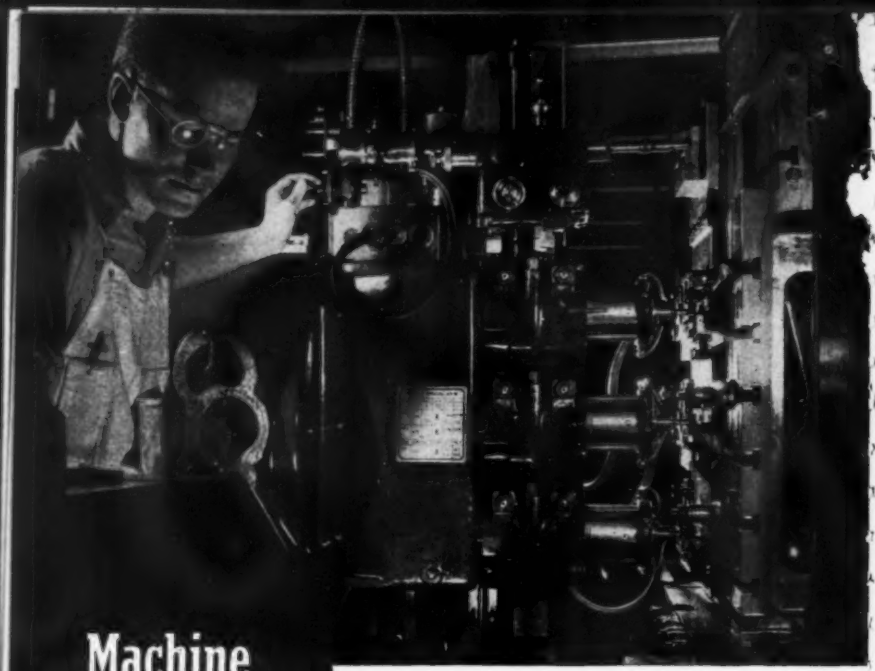


Machine with a "BRAIN" ...the Keller

RIGHT NOW, this machine is profiling anti-aircraft gun parts, three at a time. *Two years ago* it was working on agricultural implements. *The day after we've won the war* it can turn again to the products of peace . . . *without* conversion, *without* tooling up.

For this is the versatile Keller Machine, one of the many Pratt & Whitney products that provide *basic accuracy for mass production*. It has a mechanical-electrical "brain." Its tracer follows a master pattern . . . its cutters reproduce the pattern in two or three dimensions *precisely*. It maintains its own accuracy, does its own "thinking," demands a minimum of attention. The experience is *built in*.

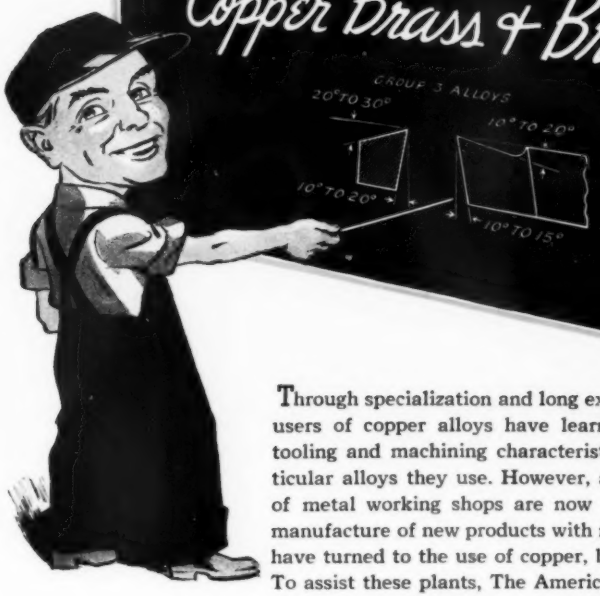
There is no better-paying investment than the right tools for each job. If you need basic accuracy for mass production, call on Pratt & Whitney.

PRATT & WHITNEY

Division Niles-Bement-Pond Company

WEST HARTFORD • CONNECTICUT

The ABC of machining Copper Brass & Bronze



Through specialization and long experience, many users of copper alloys have learned the correct tooling and machining characteristics of the particular alloys they use. However, a large number of metal working shops are now engaged in the manufacture of new products with new materials—have turned to the use of copper, brass or bronze. To assist these plants, The American Brass Company has made available a new publication, "Machining Copper and Copper Base Alloys." It offers helpful suggestions on cutting speeds, feeds, tool rakes and clearances to be used on more than 40 copper alloys—from free cutting yellow brass all the way to copper and the tough bronzes. If your manufacturing operations include turning, drilling, tapping, threading or milling any of the copper base alloys, you'll find this booklet decidedly helpful.

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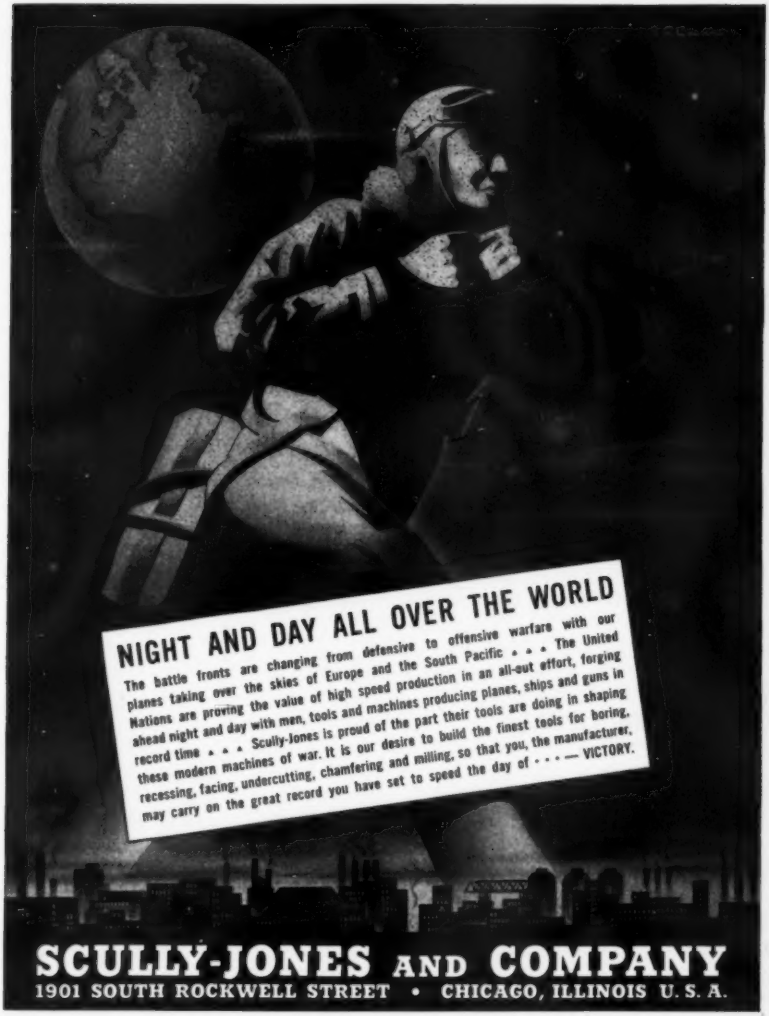
NIGHT AND DAY ALL OVER THE WORLD
The battle fronts are changing from defensive to offensive warfare with our planes taking over the skies of Europe and the South Pacific ▲ ▲ ▲ The United Nations are proving the value of high speed production in an all-out effort, forging ahead night and day with men, tools and machines producing planes, ships and guns in record time ▲ ▲ ▲ Scully-Jones is proud of the part their tools are doing in shaping these modern machines of war. It is our desire to build the finest tools for boring, recessing, facing, undercutting, chamfering and milling, so that you, the manufacturer, may carry on the great record you have set to speed the day of · · · — VICTORY.
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SAVE TIME AND MONEY THESE 5 DIFFERENT WAYS

This small compact electric furnace is inexpensive, handy and easy to operate—ideal for small tool and die shops—saves time these five different ways:

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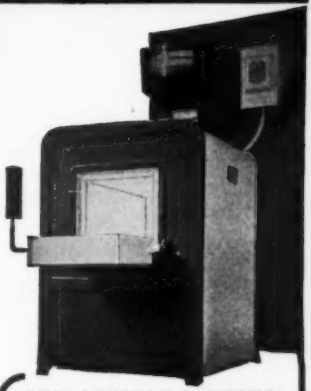
**Includes Hearth Plate*

MAX. SAFE TEMPERATURE—Continuous operation, 1750° F.; Intermittent operation, 1850° F.

AUTOMATIC CONTROL—Indicating Controlling Pyrometer—Thermo-couple and lead wire complete—$142.40.



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PROTECT your tools from breakdown on the job by wet grinding them when resharpening becomes necessary . . . avoid dry grinding methods whenever possible.

Dry grinding a tool frequently produces minute cracks or checks in the carbide tip. This is the result of localized heat rapidly generated in the area of contact between the tool and grinding wheel. These cracks are often not visible except after etching or sand blasting.

In addition to eliminating tool damage from checking, wet grinding is faster than dry, permits the use of more durable wheels, and washes away abrasive dusts. Frequently wet grinding will eliminate a finish grind on large roughing tools since 60 or 80 grit wheels running under coolant produce a fine enough cutting edge for most jobs.

When machine grinding KENNAMETAL steel-cutting carbide tools use only resinoid bonded diamond impregnated wheels with coolant, kerosene or light oil to keep the wheel clean.

Write for Catalog 43-B, the latest KENNAMETAL catalog which gives complete information about grinding methods and allied subjects on the handling and application of steel-cutting carbide tools.

*INVENTED AND MANUFACTURED IN U. S. A.

McKENNA METALS Co.
135 Lloyd Ave. Latrobe, Pa.
Foreign Sales: U. S. STEEL EXPORT CO., 30 Church St., New York
Exclusive in Canada and Great Britain

KENNAMETAL
THE All American CARBIDE

The New

INDEX MILLS for 1943

A machine which has already taken a prominent position in the Victory program milling, drilling and boring on tool, die, experimental and production work.

We have incorporated all of the fine features of the old INDEX . . . PLUS these NEW ADDED FEATURES—

- ★ *New and heavier column, knee, saddle and table.*
- ★ *Height increased 4"—floor to spindle.*
- ★ *Verniers mounted on angle for easy reading.*
- ★ *½ H.P. motor.*
- ★ *Motor supporting brace.*
- ★ *Three clamping bolts head to column.*
- ★ *Power feed to Spindle, and Table.*
- ★ *Permanent table stop.*
- ★ *Graduated hand wheel.*
- ★ *Knee clamp extended to front.*

Manufactured by
INDEX MACHINE & TOOL COMPANY

Sole Distributors

BLANK AND BUXTON MACHINERY CO.

3100 E. MICHIGAN AVENUE
JACKSON, MICH.

"Those that's got 'em . . . Like 'em."

CHECK THE FEATURES YOU WANT IN A WORKBENCH...

you'll find them all in...

HALLOWELL

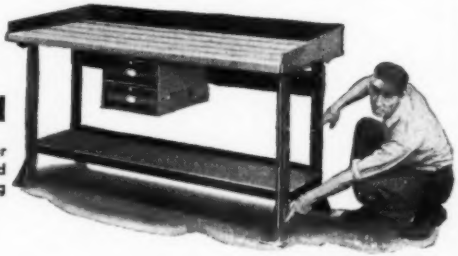
SHOP EQUIPMENT

RIGHT SIZE

"Hallowell" ready-made Work-Benches are made in five heights and widths and in seven standard lengths from 3 to 10 feet. Any number can be joined end to end for a continuous work-bench. 1367 combinations available.

STURDY CONSTRUCTION

Constructed for long wear and made to stand firm and rigid without costly, time taking bolting to the floor.



Pat'd and Pat's Pending Drawer is extra

CONVENIENCE

Pilfer-proof drawer units, shelves, cabinets, etc., are available to make the benches fit the job.

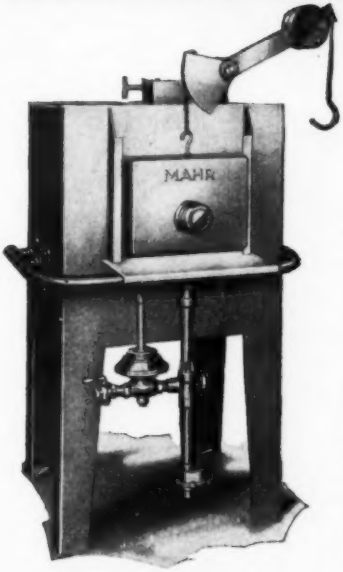
Prices and deliveries are right.

For full details get our Shop Equipment Catalog.

STANDARD PRESSED STEEL CO.

JENKINTOWN, PENNA., BOX 606 BRANCHES: BOSTON · DETROIT · INDIANAPOLIS · CHICAGO · ST. LOUIS · SAN FRANCISCO

Bright, Scale-Free Tools and Dies— NO DECARBURIZING



when you heat treat with a TYPE "AC"

MAHR

ENGINEERS • DESIGNERS • MANUFACTURERS ALL EQUIPMENT FOR METAL HEATING

TOOL FURNACE

Equipped with

CARBONACEOUS MUFFLE BLOCKS

Atmosphere, temperature and hardening are perfectly controlled in this MAHR Tool Furnace. It is especially adapted for using carbonaceous muffle blocks, so that stock being treated will come out bright, scale-free—and will not be decarburized. You are sure of accurate, pre-determined results.

Also furnished without muffle as a direct fired furnace, where effect of combustion gases is not detrimental to stock, or where refinements of a protective atmosphere are not necessary.

MAHR Type "AC" Tool Furnace

Without blower, for connection to shop air line. Also self-contained unit with blower and motor attached. Underfired to 1800° F. Over and underfired to 2600° F.

MAHR Standard Pot Type Furnace

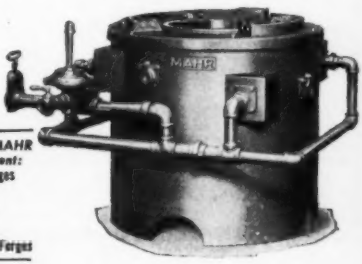
for salt and other molten baths. Gas or oil fired. Made in several sizes and types, either rectangular or cylindrical. Built for longer pot life. Can be supplied with or without hood.

Sales Offices in Principal Cities

MAHR MANUFACTURING CO.

DIVISION OF DIAMOND IRON WORKS, INC.

1713 North Second Street, Minneapolis, Minn., U. S. A.



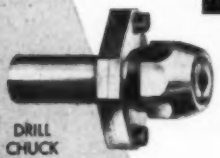
MAHR FURNACES FOR EVERY HEAT TREATING NEED

Annealing	*Furnace Types:*	*Other MAHR*
Carburizing	Car Bottom	*Equipment:*
Baking	Pit	Rivet Forges
Hardening	Pusher	Torches
Forging	Roller Hearth	Burners
Drawing	Continuous	Blowers
Stress Relief	Pot	Valves
	Rotary	Smithing Forges

A Parade of Champions

★ ★ ★ ★ ★ ★ ★ ★

ALCO

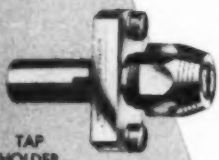


DRILL CHUCK

RELEASING TAP HOLDER

Here is the complete line of Alco Tools for every drilling, tapping, and thread cutting operation . . . Designed for Efficiency . . . High Speed . . . and Economy.

★



TAP HOLDER

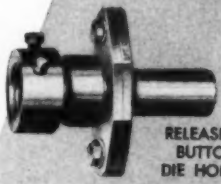
Regular models for automatics . . . Releasing models for hand screw machines and turret lathes.

RELEASING ACORN DIE HOLDER

★

Require no bushings . . . Make tools last longer . . . Prevent work spoilage . . . Insure absolute concentricity.

ACORN DIE HOLDER



RELEASING BUTTON DIE HOLDER

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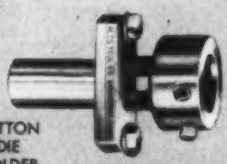


BUTTON DIE HOLDER

HOLLOW MILL HOLDER

ALCO TOOLS EFFICIENT

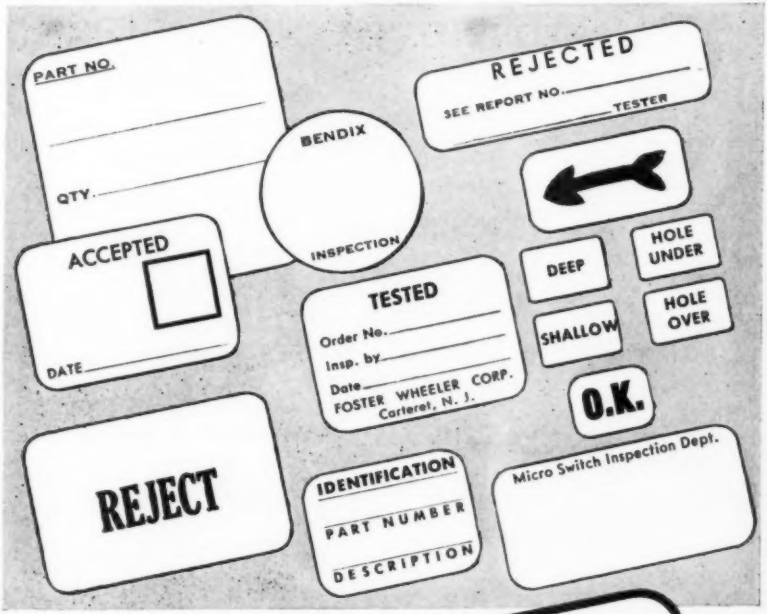
THE ALCO TOOL CO., 252 Birdseye St., Bridgeport, Conn.

Detroit Office — 908 Stephenson Bldg.

INSPECTION STICKERS
REJECTION STICKERS
IDENTIFICATION STICKERS
INSTRUCTION STICKERS

MAGIC KUM-KLEEN STICKERS STOP ERRORS, SPEED PRODUCTION

Simply press on—no moisture required—adhere to any smooth surface (can be applied directly to products in production)—never pop off—yet are easily peeled off.



Magic Kum-Kleen Stickers won't pull off like string tags, fall off like wet stickers, rub off like chalk marks, pull out like pins.

Write today for free samples.

AVERY ADHESIVES, Dept. MTBB-4,
451 East Third Street, Los Angeles.

In Canada, Enterprise Sales & Distributors, Toronto.

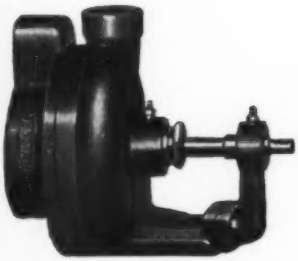
AVERY
Kum-Kleen
DRY LABELS

FULFLO COOLANT PUMPS AND VALVES

Here's ONE FREEDOM That's Yours Right Now

FREEDOM FROM MAINTENANCE WORRIES OR COSTS

Fulflo Coolant Pumps and Valves are designed so scientifically and built with such precision that your only expense is installation. They're trouble-free, maintenance-free . . . and that's something to shout about these days with man-power so critically lacking.



MODEL FRS4

Write for The Fulflo Mechanical Data Book . . . your personal copy will be sent postpaid.

TRADE MARK "FULFLO" REG. U.S. PAT. OFF.

FULFLO CENTRIFUGAL COOLANT PUMPS

Pipe sizes 3/8" to 1½". Over 75 models to fit almost every purpose, or built for your special requirements. Uniform, unvarying flow of coolants assured to the exact points specified.

FULFLO BY-PASS OIL-RELIEF VALVES

Pipe sizes ¼" to 2" . . . pressure 0 to 350#. Five different springs regulate variation in pressures.

NON-CHATTERING
Cast iron or brass bodies; brass, hardened or stainless steel pistons.

THE TRADE MARK "FULFLO" REG. U.S. PAT. OFF. Specialties Co., Inc.
BLANCHESTER, OHIO

Interchangeability of Machined Parts

calls for

ASCO DIAMOND TOOLS

Shaped Diamond Tools • Truing and Dressing Tools For Every Purpose • Valve Refacing Tools • Tungsten Diamond Wheels • Wire Dies • Core Bits Diamond Powder

THE amazing quantity and quality of American mechanical weapons are largely due to interchangeability of machined parts. This modern miracle is made possible to a great extent by the use of shaped diamond cutting tools, which cut faster, insure a better finish and cut for much longer periods between tool changes, than any other type.

For more than thirty years many of the largest and most prominent manufacturers in the United States have regarded Anton Smit & Company, Inc., as the most dependable source for industrial diamonds. Today the handiwork of Asco Shaped Diamond Tools is to be found in many types of American war machines that will soon carry the fight across the borders of the Axis Powers.

Send blueprints of your requirements for quotations. Write for folder.

ASCO DIAMOND TOOLS

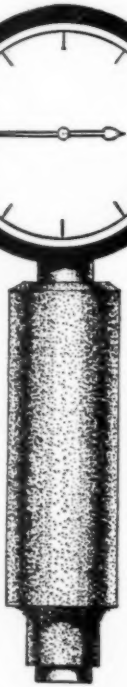
ANTON SMIT & CO., Inc.

Leonard J. A. Smit, *Managing Director*

333 WEST 52nd STREET NEW YORK, N. Y.

Detroit: ANTON SMIT INDUSTRIAL DIAMOND CO., Inc., 8100 Lyndon Ave.

TRITON



The fundamental basis of all war production is precision and speed.

Substitute your flush pin gauges, snap height gauges, etc. for special dial indicator gauges. They are:

MANY TIMES FASTER IN OPERATION.

NEVER WEAR OUT.

MAKE NO MISTAKES IN READING.

We will design special dial indicator gauges to meet your requirements.

Write and tell us your problem—we might have the solution.

SPECIAL TOOLS
RING GAUGES
PLUG GAUGES
SNAP GAUGES
AND SPECIAL GAUGES

PROMPT DELIVERIES

TRITON PRECISION CORP.
GAGE AND TOOL MANUFACTURERS

1302 INWOOD AVE. N.Y.C.

GRINDALL

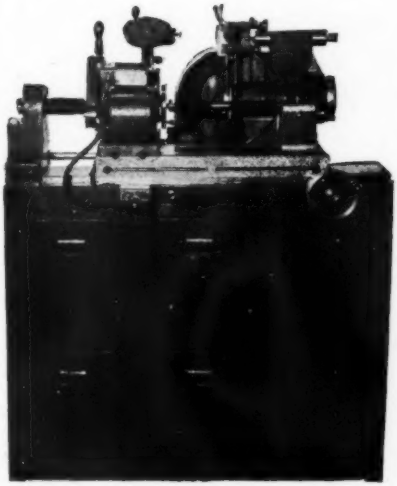
EXTERNAL GRINDER
INTERNAL GRINDER
TOOL GRINDER

THREAD GRINDER

MODEL B–6" x 12"

Tool and production executives from everywhere, from Maine to California, and from foreign countries have come to our plant to see this thread grinder in operation.

After seeing the accurate work it produces, the simple fool proof and ingenious design and the high rate of production of this thread grinder, they have ordered from one to several machines.



Model B for Grinding External or Internal Threads

The accuracy of the GRINDALL thread grinder is unsurpassed.

It can be set up for any thread grinding job internal or external in ten minutes.

It is simple in design and operation and anyone who can measure accurately can learn to operate the machine and be thoroughly familiar with it in a few hours.

Orders are piling up fast.

Investigate if you wish early delivery.

Representatives in all principal cities.

GENERAL MACHINE TOOL CO. SENECA FALLS, NEW YORK

"JOE" by Given

Joe Solves His Butter Problem

A GIVEN VARI-SPEED DRIVE on any older machine tool will turn spindles 30% faster—or more—and permit faster operation while still keeping useful slow speeds. And while you may not be able to perform extra operations such as Joe has figured out, *you can produce more parts* because these additional r.p.m. give the needed boost to old tools for efficiently using high production carbide tipped tools!

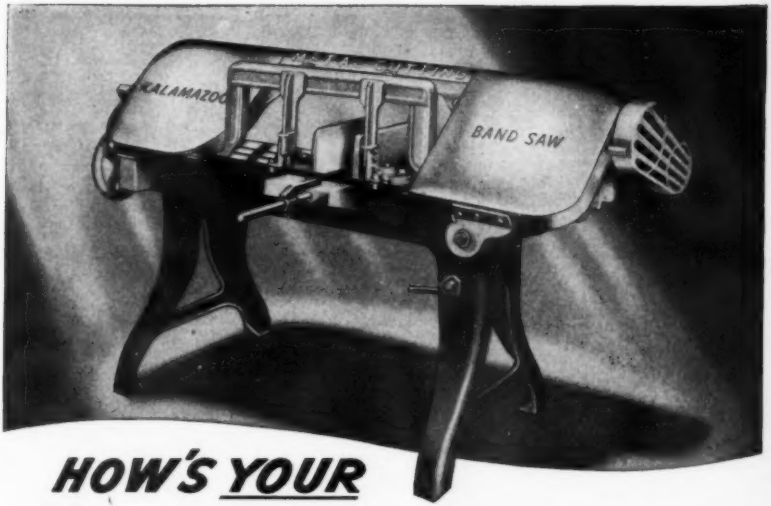
The GIVEN makes proper speed selection easy. Convenient handwheel permits adjusting speeds up or down for all work diameters . . . all types of metals. No belts or pulleys to change, no gears to shift. *The GIVEN saves time and tools!*

One to ten horsepower sizes and various mounting brackets easily adapt the GIVEN to lathes, mills, shapers and other shop tools of all types, all ages, all sizes. One four-bolt connection to the machine tool mounts the Drive for operation.

Full details, including descriptive literature and blueprints on mounting the GIVEN are yours for the asking. *Write us today . . . and include your machine tool list for prompt recommendations!*

Given VARI-SPEED DRIVE

GIVEN MACHINERY CO. • 3855 SANTA FE AVE. • LOS ANGELES



HOW'S YOUR Metal-Cutting Equipment?

Many plants, otherwise top-notch in efficiency, are losing time and money in the rough-cut department. That's why more and more are switching to Kalamazoo Metal-Cutting Band Saws! These modern precision machines allow cuts within thousandths of an inch — save machining time and precious metal. New, stronger type drive carries full 5500 pound load—double that of similar saws. New hydraulic control gives instant holds in any position on frame. 8" x 16" and 8" x 24" capacities. Send for complete specifications.

Immediate Deliveries Now Available!

MACHINE TOOL DIVISION

KALAMAZOO TANK & SILO CO.

508 HARRISON STREET KALAMAZOO, MICH.

Prevents Delays due to Loss, Theft, etc.

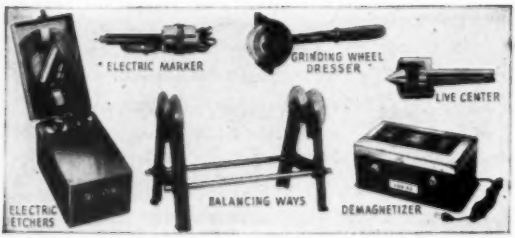
IDEAL METAL ETCHER

Permanently Marks Everything Made of Iron, Steel or Their Alloys

Electrically marks important information on smooth-surfaced Parts, Tools, Dies, Gauges, etc., 14 heats — 115 to 1300 Watts. Low heats for fine lines on small and thin parts—high heats for bold lines on large and heavy parts. Etches legibly, easily, permanently, regardless of the hardness of the tool or part. Convenient ground clamp for etching large, heavy parts and castings.

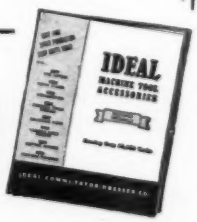
MOST COMPLETE LINE ON THE MARKET

Electric Markers — Electric Etchers



Machine Tool Accessories Catalog FREE

Gives detailed descriptions of the products illustrated at the left, and many others that help step up war production.



Write for Detailed Literature on These

IDEAL **WAR PRODUCTION SPEEDERS**

IDEAL COMMUTATOR DRESSER CO.

1441 PARK AVENUE SYCAMORE, ILLINOIS

Sales Offices in all Principal Cities.
In Canada, Irving Smith, Ltd., Montreal, Quebec.

Quick-Change HOLDERS AND ADAPTORS!

Now You Can Change Tools in 5 Seconds

On Milling Machines and Boring Mills

Illustrated above:

1. Holder in Spindle.
2. Boring Head and Bar.
3. Face Mill Adaptor.
4. Side Mill Adaptor and Cutter.
5. Eccentric Chuck and Adaptor.
6. Drill Chuck and Adaptor.
7. Boring Bar.
8. All-Purpose Adaptor and Cutter.
9. Drill Sleeve and Drill.

10 and 11. End Mill Adaptors and Cutters.

Step up your production 25% with our new-type holders and adaptors of advanced design that hold the tool absolutely rigid, insuring a new "high" in accuracy, and a new "low" in spoilage. The holder, when permanently installed on boring and milling machines, makes it possible to interchange adaptors in 5 seconds. Holder and adaptors hold tools so firmly that tools cannot pull out or change position in any way during cutting operations. Finished to precision tolerances.

They Pay For Themselves In Short Time

On machines where tools are changed frequently, the saving in labor will pay for the holder and adaptors in a few weeks' time. Used by leading aircraft and machine manufacturers to speed up war work.

Milling Machine Adaptor Corporation

1400 W. Fort St. Detroit, Mich.

Write for LITERATURE

The DRIVE TO GREATER PRODUCTION

INTEGRAL adaptation illustrated in the milling machine shown, is a feature of Berkeley Power Drives. These unit drives give the increased production you would only expect from a complete new machine. A Berkeley driven machine tool is ready for higher speeds and deeper cuts. The change is simple — Berkeley welded steel brackets are engineered to fit your machines and need no extra gadgets. The facts should be in your hands today — just a word by mail or wire will bring them.

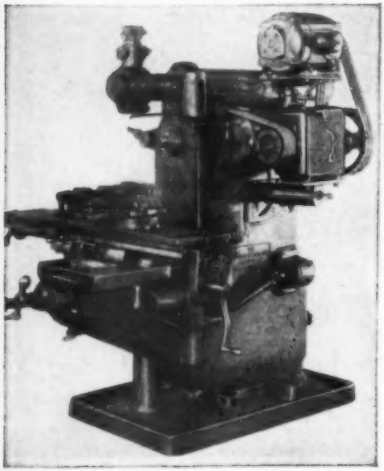


Fig. 55

GREATER PRODUCTION STARTS HERE

DRIVES FOR

Lathes, Shapers, Planers, Milling Machines, Punch or Drill Presses, Grinders of All Types, Any Machine Tool.

Berkeley

Power Drives

V-Belt • Helical Gear • Transmission

BERKELEY EQUIPMENT COMPANY
(Formerly located at Corry, Pa.)

New Plant and Office;
1022 Bahls Street
Danville, Ill.

Women POWER, too

. . . IS SERVED BY "Buffalo" DRILLS

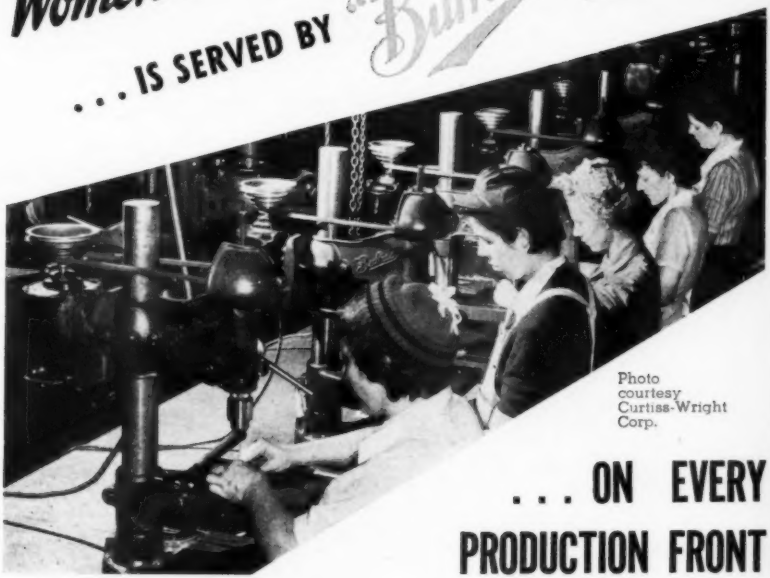


Photo courtesy Curtiss-Wright Corp.

. . . ON EVERY PRODUCTION FRONT

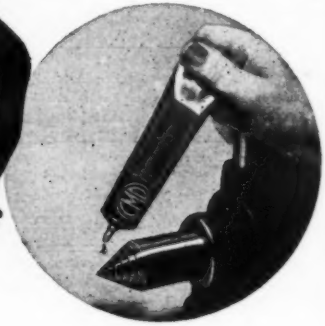
● Buffalo Drills are willing team-mates of the great woman army now serving Industry. That's because Buffalo Drills are designed for quick, accurate control — easy control which conserves human energy and insures more accurate work every hour of the shift. . . . On the production line, in the precision workmanship of the tool rooms, Buffalo Drills are playing a winning role in getting the **Job** done better and faster!

BUFFALO FORGE COMPANY
161 Mortimer Street Buffalo, N. Y.
Canadian Blower and Forge Co., Ltd., Kitchener, Ont.

"Buffalo" **DRILLING MACHINES**

Increase Machine Output

with CMD CENTER POINT LUBRICANT



The amazing film strength of CMD Center Point Lubricant prevents over-heating and annealing of center points, speeds-up work, and permits heavier cuts and finer tolerances. CMD Lubricant withstands pressures greater than 50,000 pounds per square inch. Try it! You'll use it regularly.

A COMBINATION You Can't Beat!

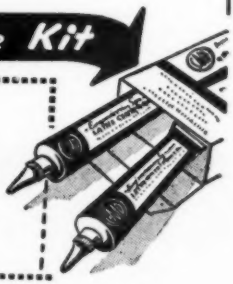
For faster, smoother tooling, equip your machines with **CMD Helical Groove Centers** and lubricate them with **CMD Center Point Lubricant.** The exclusive left-hand helical groove conveys the film of oil to the extreme point, **assuring complete** and **constant coverage** of the **entire bearing surface.**

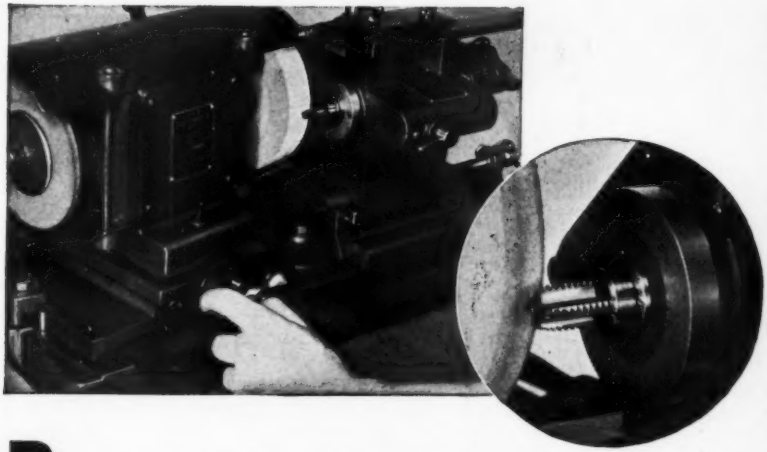
Write for FREE *Sample Kit*

CHICAGO MANUFACTURING & DISTRIBUTING COMPANY
Dept. 4-BB, 1928 West 46th St., Chicago, Ill.

- ☐ Send circular on CMD Helical Groove Centers
- ☐ Without obligation to us, send FREE sample kit containing a tube of CMD CENTER POINT LUBRICANT and a tube of CMD CENTER POINT LUBE (grease) with directions for making an amazing, simple test.

NAME.....
FIRM NAME.....
ADDRESS.....





BLAKE TAP GRINDERS

for accurate, low cost tap sharpening

Don't discard dull taps — sharpen them on the chamfer on a Blake Tap Grinder. This versatile machine helps you five ways, (1) it conserves High Speed and Carbon Steels, (2) it increases tap life by thousands of holes, (3) it eliminates delays caused by waiting for new taps, (4) it maintains the accuracy of your products, (5) it is also ideal for grinding countersinks and other small tools.

The Blake Tap Grinder will sharpen right- or left-hand taps with 2, 3, 4, 5, 6, 8 or ten flutes. Capacity is from No. 0 to 2 inches.

Get complete information on the Blake method by mailing the coupon today!

MAIL THE COUPON TODAY!

Please send folder giving complete details on the Blake Tap Grinder.

NAME ..... TITLE.....

COMPANY .....

STREET .....

CITY ..... STATE.....

H.

EDWARD BLAKE COMPANY

634 COMMONWEALTH AVE., NEWTON CENTRE, MASS.

BLAKE TAP GRINDERS — FILTAIRE PORTABLE DUST COLLECTORS — AMERICAN TOOL HOLDERS — BLACK DIAMOND PRECISION DRILL GRINDERS — L & D HIGH SPEED DRILL PRESSES

JEFFERSON FOR

JEFFERSON PRECISION MILLING MACHINES

Four speeds: 200, 400, 1,000 RPM

Power Feed Floor Type, No. 200F	$550
Power Feed Bench Type, No. 200B	$515
Hand Feed Floor Type, No. 100F	$500
Hand Feed Beneh Type, No. 100B	$465

Complete with standard motor, reversing control, draw-in attachment and ½" collet. Prices f. o. b., Cincinnati

Other speeds—variable speed drive, 90 to 2,300 RPM — extra	$125
Concealed coolant pump, complete, extra	$ 90
Vertical Head attachment, extra	$100

Jefferson Precision Milling Machines are built with exceptional sturdiness in every detail. They combine fast, accurate production with ease of operation. Capable of obtaining close tolerance and of handling a large volume of work. Proven ability and low-cost performance on such operations as die sinking, contour profiling, angular milling, jig boring, routing, plus practically all essential milling operations on ferrous and non-ferrous metals and plastics.

Spindle mounted in tapered Timken roller bearings. Dove-tailed slides, gibbed and hand scraped to perfect alignment. Silent, powerful V belts maintaining constant pulling power.

PROMPT DELIVERY

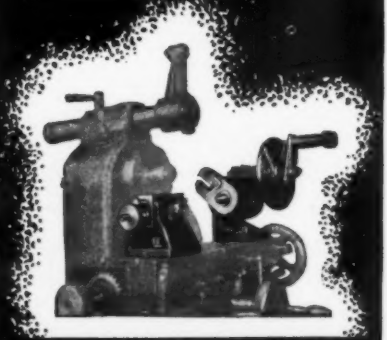
6" TILTING DIVIDING HEAD

with 3 indexing plates and tailstock:

Actual swing 6". The utmost in a well balanced, rigid, accurate dividing head. Material and workmanship of highest grade and made to close inspection.

Also . . . 7½" SWIVEL BASE DIVIDING HEAD, with 3 indexing plates, one rapid indexing plate and tailstock.

Write for descriptive folder



JEFFERSON MACHINE TOOL CO. 700 W. FOURTH ST., CINCINNATI, OHIO

ACCURACY — SPEED AND TOP PRODUCTION

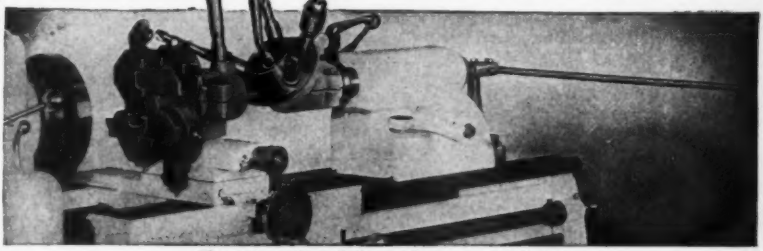


Photo above shows Jefferson Turrets on 16" lathe

5 Tool-Tail Stock Turret

PAT. PENDING

Convert

YOUR ENGINE LATHE INTO A TURRET LATHE IN 15 SECONDS

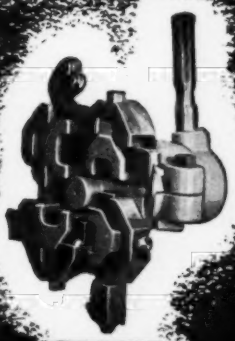
Yes it's as easy as that! You simply attach the Jefferson Tail Stock Turret, and the Jefferson Adjustable Pull Feed to your lathe as shown in top illustration.

The productive capacity of these machines will be more than doubled in many instances because there is available at all times nine different tools.

With these three JEFFERSON time saving devices attached to a lathe, any kind of work may be done, such as forming, roughing, boring, finishing, knurling, drilling, tapping, etc. without stopping the lathe or changing tools. The JEFFERSON TURRETS are substantially built, rigid and extremely accurate. Made in several sizes to fit small bench lathes up to 24" swing.

TURRET DELIVERIES IN SIX DAYS

Write for details, also literature on the Precision Milling Machine, Dividing Heads, Vises, Swing Frame Grinder, Endless Belt Sander, Foundry Riddle.



4 Tool Tool Post Turret

JEFFERSON MACHINE TOOL CO. 700 W. FOURTH ST., CINCINNATI, OHIO

PRESSUREMATIC

POWER PRESSES

AUTOMATIC PRESSURE CONTROL

Solenoid controls stop or back ram off work automatically at pre-set pressure.

IMMEDIATE DELIVERY!

Lempco won the "E" award for outstanding war production

$215 to $1398

Electric and Hydraulic PRESSUREMATICS are made in 40 and 60 ton models. They're good at straightening, bending, assembling; they're press-fitting tank parts, forming bullet dies. Fast-acting, too—from 0 to 60 tons in 4 seconds.

WRITE TODAY FOR SPECIFICATIONS

LEMPCO

BEDFORD, OHIO

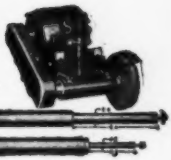
★ STANDARD ★

The Victory Line

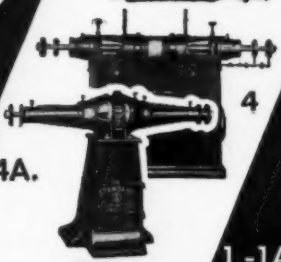
1.

2.

3.



1A.



4. 4A.

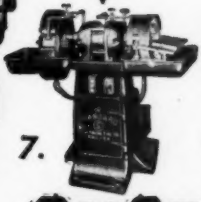
5.

5. Multiple Speed Grinders, belted motor drive. 10" to 30" wheels.

6. Speed Lathes. All types and sizes. 1/2 H.P. to 5 H.P.

7. Carbide Tool Grinders, wet or dry. Twelve models.

8. Disc Grinders. 10" to 30" diameter discs.



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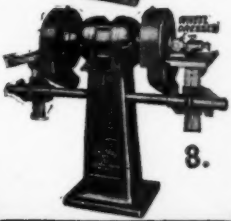

8.

1.-1A. Tool Post Grinders, direct and belted motor drive.

2. Pedestal Grinders. 1/4 H.P. to 15 H.P.

3. Double End Wet Grinders 12" to 24" diameter wheels.

4.-4A. Buffers - Polishers. 1/2 H.P. to 25 H.P. Direct and belted motor drive.

Earlier deliveries now available.

The STANDARD ELECTRICAL TOOL Co.

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(formerly Vickers Broach & Gage Company)

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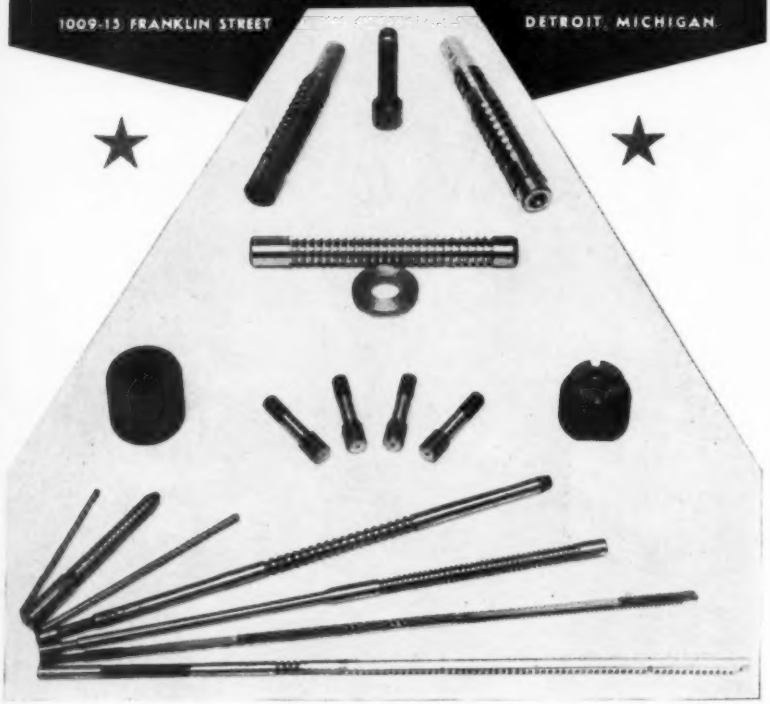

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X-Ray Inc., our new associate company specializing in Metallurgical Radiography, now also under operation.

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A TOUGH GUY!

(MADE IN AMERICA)

The Toughest, Fastest, Most Efficient GEAR BOX DRIVE You Could Ask For!

TURNER UNI-DRIVE

Motorizes Machine Tools

For Lathes, Milling Machines, Shapers, Turret Lathes, Radial Drills, Boring Mills, Hobbing Machines and various machine tools . . . also Brown & Sharpe and Cleveland Automatic Screw Machines. Can also be adapted to many special applications.

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THIS is no time to waste time . . . America and her Allies, fighting side by side all over the world for the preservation of the United Nations and freedom, have a job to do . . . *and fast!* Enlist the aid of Turner Uni-Drive units in your plant and you'll at once find what a *real fighting tool you have in your organization to help you speed up production* . . . keep down power costs . . . eliminate costly overhead countershafts.

STEPS UP PRODUCTION 35% TO 300%

Now successfully used in many of America's largest defense plants—increasing production capacity as much as 300%. Guaranteed for one year against defects in workmanship and materials and sold subject to return for full credit within 60 days if not satisfactory.

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The TURNER UNI-DRIVE COMPANY

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QUICKLY, EASILY INSTALLED

The TURNER UNI-DRIVE can be quickly and easily installed within a few hours without completely shutting down your shop.

NOW AT WORK FOR VICTORY ★★★

PRODUCING MACHINE TOOL DRIVES • ORDNANCE TOOLS • AIRCRAFT FITTINGS

Turning AND *Centering*

IN **1** OPERATION

With R and L Tools

This Combination Tool is the only Right and Left Hand tool on the market. Can be changed from right to left and vice versa in 10 seconds. Replaces 14 tools costing 4 times as much.

Here are some of the multiple operations that can be done with the R and L: Pointing work concentric with turned diameter; drilling and chamfering; turning and forming special shape or end of part while drilling or reaming; turning one diameter—chamfering two corners, facing end of part along with drilling or reaming; turning two diameters while drilling or reaming; turning shoulder concentric with stock diameter.

You can readily see the enormous savings in time, trouble and money that can be effected by the use of R and L Turning Tools.

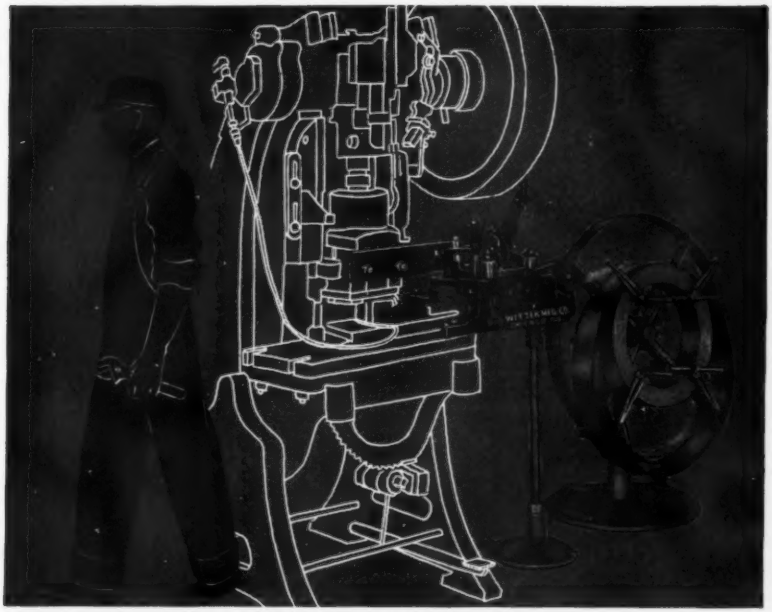
Write for 44-page booklet describing all the uses of R and L.

R AND L TOOLS

1827 BRISTOL ST. NICETOWN, PHILADELPHIA, PA.

WAR PRODUCTION *rolls out faster with*

WITTEK *Automatic*
ROLL FEEDS AND REEL STANDS



The major problem confronting industry today is increased war production. Manufacturers of metal stampings must recognize automatic feeding of coiled strip stock to punch presses as vital to the solution of their problem.

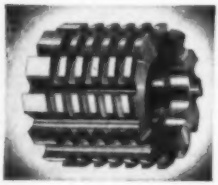
Wittek Automatic Roll Feeds and Reel Stands are designed and built by engineers with years of experience to guide them. With Wittek you can conserve man-hours and maintain new high production schedules.

✱ *Write for Descriptive Catalog*

WITTEK MANUFACTURING CO., 4305-15 W. 24th Pl., Chicago, Ill

The PLAN-O-MILL *is Accurate!*

● One big reason why Plan-O-Mill form and thread milling machines are obsoleting older and bulkier equipment is their ability to *produce*. But alongside Plan-O-Mill's amazing production record is a standard of accuracy that many slower, less productive machines are unable to attain.



Plan-O-Mill THREAD MILLING CUTTERS left) are made with the same regard for precision that is evident throughout Plan-O-Mill manufacture. For more information on how Plan - O - Mill can do your threading and form-milling job better, faster, and more accurately, contact the Plan-O-Mill dealer nearest you. See list at right.

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Special CUTTING TOOLS

for LONGER CUTTING LIFE

This young, fast growing plant is manufacturing Special Cutting Tools of such accuracy and workmanship that they actually have a longer cutting life—and a higher production for the many defense plants who use them.

Special tooling equipment which we have devised enables us to approach production speeds on certain types of cutting tools.

In spite of our very rapid increase in production we are in a position to take on a considerable volume of round work at attractive delivery schedules.

Check your immediate needs today and send us your prints for quick estimates.

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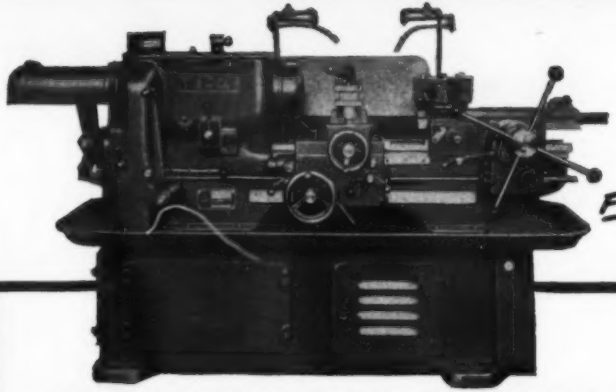

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TURRET LATHES FOR BAR OR CHUCKING WORK

Infinite spindle speeds . . . Multiple disc clutch . . . Power feeds for the turret and cross slide . . . 8 feed changes available . . . Timken bearing . . . Self-locking turret . . . Automatic stops . . . Turret clamps and unclamps automatically . . . Independent adjustable stop for each turret face.

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1" hole in spindle, 6" turning length, 14" swing over bed. Infinite spindle speeds 60 to 2000 RPM, constant speed motor, 1800 RPM.
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No. 3 TURRET LATHE
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No. 4 TURRET LATHE
2" hole in spindle, 12" turning length, 19½" swing over bed. Infinite spindle speeds 35 to 1500 RPM, constant speed motor, 1200 RPM.
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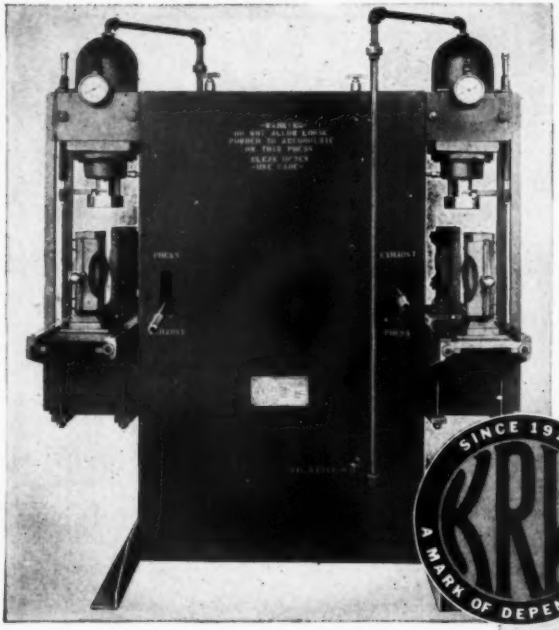
KRW HYDRAULIC ARBOR PRESSES

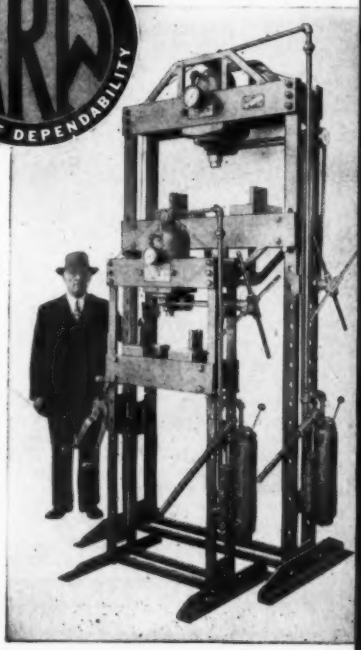


Engineered for War Production

★ ★

Illustration below shows a special extra high 75-ton KRW Hydraulic Arbor Press in comparison with the standard 25 ton unit.

SINCE 1916 KRW A MARK OF DEPENDABILITY



With standard KRW Hydraulic Arbor Presses as a work-proven basis, we have been able to speedily design and build many special presses for war production—without time-consuming engineering delays. The net result has been a greatly accelerated production of vital equipment which is helping to speed the day of Victory.

As an example: The large illustration shows a special, 4-man operated, air-oil press which is used extensively for bomb loading. Hundreds of these units are now in operation.

KRW also builds standard Hydraulic Arbor Presses in 25, 50 and 75-ton capacities in addition to bench-type Arbor Presses in 1/2, 1 and 3 ton capacities. If you have a problem that an arbor press might solve, talk to us. The facts concerning many successfully-solved production applications are available in our files.

K. R. WILSON

10 LOCK ST. BUFFALO N. Y.

More production per worker!

FOOT CONTROL LEAVES BOTH HANDS FREE TO WORK!

Features: *Vise opens and closes instantly . . . Remains open or closed without constant foot pressure . . . Exerts grip of 15 times air-line pressure . . . Measures 12 x 6½ x 6 in. . . . Jaw width 3 in. . . . Jaw depth 2 in. . . . Maximum opening 3 in. . . . Maximum travel ½ in. Attaches to air line or individual compressor.*

SPEEDY AIR VISE
complete with Foot Control Valve, Air Hose and Fittings . . **$24**

Want more production? Follow the example of leading war plants — put *Speedy Air Vises* to work! This foot-controlled, pneumatic vise leaves operator's both hands free for safe, fast insertion and removal of work. You'll find it cuts time, labor and costs, reduces fatigue. Sturdy, compact, precision-built . . . so low in price it can be economically used on every drill-press, miller, filer and assembly line. Prompt delivery. Ask your distributor or write for details.

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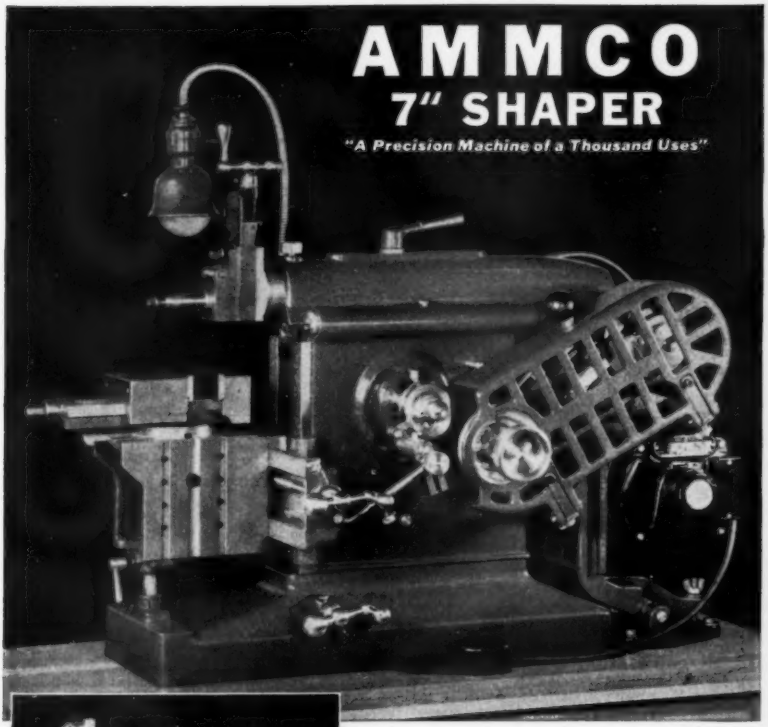
AMERICA'S MOST TALKED-ABOUT VISE . . . AT A PRICE!

AMMCO
7" SHAPER
"A Precision Machine of a Thousand Uses"



IT'S PORTABLE
--Saves Steps and Time--

Don't tie up a big shaper when so many jobs can be done just as accurately and much quicker and more economically on the AMMCO 7" PRECISION SHAPER.

Available for stationary installation or mounted on portable cabinet easily rolled to the mechanic's workbench...Write today for specifications and prices.

AUTOMOTIVE MAINTENANCE MACHINERY CO.
2106 Commonwealth Avenue **North Chicago, Ill.**

FOR MAXIMUM PRODUCTION — Vari-speed drive

FOR EXCEPTIONAL POWER — Back gearing

FOR SMOOTHNESS — Helical cut gears

FOR LONG LIFE — Anti-friction bearings

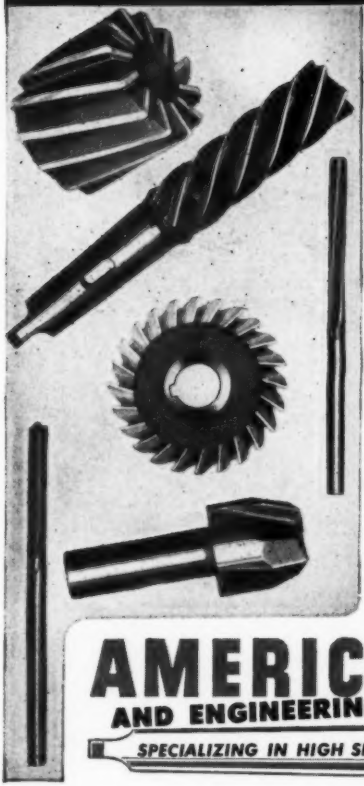
GET A *Vernon* 12" SHAPER

These and other features make the new Vernon the best shaper on the market to relieve larger machines and get work out faster. Orders placed now get prompt delivery! Send for new bulletin with complete specifications.

MACHINERY MANUFACTURING COMPANY
1915 EAST 51 ST., VERNON LOS ANGELES, CALIFORNIA
Vernon Line of HORIZONTAL MILLS, VERTICAL MILLS & JIG BORERS, 11" SHAPERS & GRINDERS

More Cuts per Minute at Less Cost per Month

A.C.E. SPECIAL CUTTING TOOLS



A.C.E.'s long-wearing cutting tools are the result of careful study of customers' cutting needs and expert workmanship. Each tool is given complete and thorough inspection at all stages by an inspection department organized as a separate unit. This has resulted in a minimum of rejects.

Making *Special* Cutting Tools (we make none for stock) it has been difficult at times to keep up with the ever increasing demand for tools of our quality. However, modern methods and long experience have enabled us to handle the many set-ups required at almost mass production speed.

Send us your urgent inquiries on round work—we will send estimates promptly. Illustrated bulletin on request.

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SPECIALIZING IN HIGH SPEED CUTTING TOOLS TO YOUR PRINTS

CIRCLE "R" Metal Cutting Tools

Made by Perfectionists

★

Also Metal Cutting Saws of all types

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CIRCULAR TOOL CO., INC.

PROVIDENCE, R. I.

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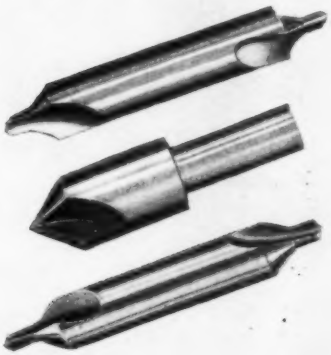
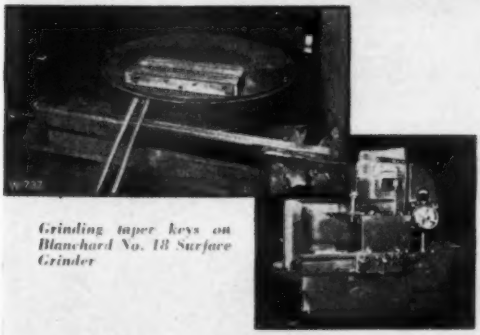
Our combination drills and countersinks are milled on this machine designed by our own engineers. Depth of cut and spiral are automatically controlled, assuring accuracy and uniformity.



"PUT IT ON THE BLANCHARD"



Grinding taper keys on Blanchard No. 18 Surface Grinder

EVEN though fixtures are sometimes necessary on a Blanchard Surface Grinder, a simple design is often very satisfactory. A simple tapered shoe is used for holding 16 tapered keys in the set-up shown above. ¼" to ½" of stock is removed from one side of each key to limits of .002". 48 pieces are ground per hour.

If greater production is required, two fixtures could easily be accommodated on the 36" magnetic chuck. Magnetism holds the fixture on the chuck and helps to hold the work down in the fixtures.

The BLANCHARD
MACHINE COMPANY
64 STATE STREET, CAMBRIDGE, MASS.

Send for your free copy of "Work Done on the Blanchard." This book shows over 100 actual jobs where the Blanchard Principle is earning profits for Blanchard owners.

BLANCHARD

CHECK THESE ADVANTAGES OF BLANCHARD GRINDING

★ Production
★ Adaptability
Fixture Saving
Operation Saving
Material Saving
Fine Finish
Flatness
Close Limits

. . . . . *Especially valuable on jobs like the one illustrated.*

Characteristic of the design of all STURDIMATIC LIVE CENTERS is a low overhang and a slight cushioning action . . .
that compensates for expansion due to heat, shock and excessive thrust loads—reducing wear to a minimum. A properly engineered live center is one of the fundamentals of setting up a job and requires a specialist's experience . . . standard shanks with Morse taper carried in stock.

Send us your specifications and blueprints—We will see that your job is set up with the right LIVE CENTER—prompt deliveries on high priorities.

STURDIMATIC
TOOL COMPANY
5224 THIRD AVE. DETROIT, MICH.

★ *There's a Reason*

WHY MARSHALLTOWN PRESSES GIVE YOU

★ **BETTER PRODUCTION**
★ **LONGER LIFE**

Yes, you can rely on the performance of a Marshalltown Press—they give you the most for your money, because they are engineered and built for dependable trouble-free service. Features include—more die space, chrome molybdenum cranks, wrist pin connections and many other proven advantages.

Write today for literature about Marshalltown Presses —available in capacities from 5 to 70 tons.

NO. 5 FLYWHEEL TYPE

MARSHALLTOWN MFG. CO.
900 E. Nevada Street MARSHALLTOWN, IOWA

CONWAY CLUTCHES

PRECISE

. . built with the precision of a fine instrument.

SIMPLE

. . no superfluous parts.

POWERFUL

. . transmitting maximum power at desired speeds.

SMOOTH

. . quiet as a mouse so you don't even know they're there.

DEPENDABLE

. . once installed CONWAY CLUTCHES become your faithful servants without further maintenance.

PATENTED
in U.S.A. and Canada

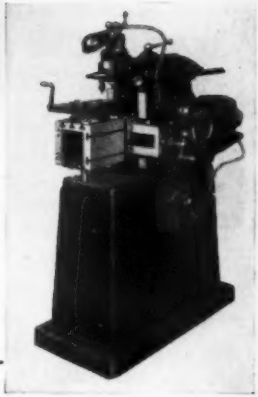
REASONABLE DELIVERIES
on models of catalog dimensions.

INSTALL----THAT'S ALL

THE CONWAY CLUTCH CO.

1541 Queen City Ave. **CINCINNATI, OHIO**

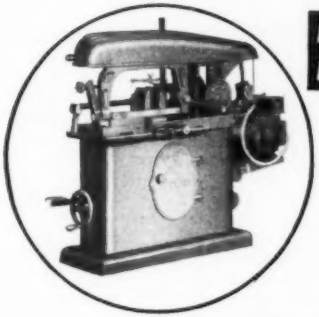
8-INCH HY-DUTY SHAPE-RITE SHAPER



Equally adapted for production and toolroom work. Meets the most exacting demands for precision manufacturing. Pays for itself many times over in man-hour savings by its speedier operation and greater versatility.

For Sustained, Economical War Production

Shape-Rite Shapers and Keller Power Hacksaws meet the most severe requirements of war work. In many plants these machines operate on schedules 3 times longer than normal working requirements — yet they operate with uniform efficiency and at minimum maintenance costs. Investigate the merits of these two machines.



NO. 3 HY-DUTY KELLER POWER HACKSAW

Wet Cut. Unexcelled for production. Capacity 6¾ x 6¾. Vise swivels to 45 degrees. Capacity 45°—4 inches. Automatic safety stop. Length of blade, 14 inches. 2 speeds available, V-Belt drive. Foot lift for raising screw frame. Feed pressure control.

See Your Dealer or Write for Information.

SALES SERVICE & MFG. CO.
473 NORTH CLEVELAND AVENUE • ST. PAUL, MINN.

Here is your key to *MAXIMUM* DRILLING or TAPPING PRODUCTION—

THE Ettco-Emrick SYSTEM OF MULTIPLE SPINDLE HEADS

A typical Ettco-Emrick Multiple Tapping Head for tapping 6 holes simultaneously. A Quill Clamp is supplied with every Head to assure the rigidity needed for high precision work. The same gear case assembly is used for drilling the holes.

To get maximum production on any part in which two or more holes must be drilled or tapped you need three things: (1) Multiple drilling or tapping equipment — (2) A method of handling the particular part whereby all of the required holes will be drilled or tapped simultaneously — (3) A work holding fixture in which parts can be quickly and accurately set up and progressively fed for the drilling or tapping operations.

The Ettco-Emrick System of Multiple Spindle Heads assures you of maximum production because it satisfies all three requirements. Equipment cost is low because all Heads are made of standard parts and can be used on any drill press.

RANGE OF THE SYSTEM—High speed multiple drilling of holes from wire sizes to ½" inclusive — and multiple tapping from machine screw sizes to 5/16" inclusive.

DETAILS OF THE SYSTEM— are given in BULLETIN No. 3. Copy mailed on request. Write for it today.

ETTCO TOOL CO.

596 Johnson Ave., Brooklyn, N. Y.

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The Famous Ettco-Emrick

DRILL CHUCKS • TAP HOLDING CHUCKS
TAPPING ATTACHMENTS • TAPPING MACHINES
MULTIPLE SPINDLE TAPPING AND DRILLING HEADS
Unexcelled for Design, Materials and Workmanship

For fast drilling operations over a wide area – use...

INTRODUCED at the height of the American war expansion program, the Walker-Turner Radial Drill filled a need so widely recognized that its acceptance was immediate and overwhelming. After two years of intensive job-testing, it is still without a peer in its field. During this time, it has served to straighten out kinks in many overcrowded production lines. Aircraft plants, shipyards, tool rooms, metal fabricating plants of all kinds know the unique usefulness of this fast, rugged, versatile radial drill. There's a place in your shop, too, for this hard-working machine tool.

WALKER-TURNER COMPANY, INC.
1743 Berckman Street Plainfield, N. J.

Photographs courtesy Lockheed Aircraft Corporation. The Walker-Turner Radial Drill is used for fast, light drilling, tapping and routing. Drills to center of 62" circle. Head tilts to 45° right or left. Spindle speeds 160 to 8200 r.p.m. Price $352.50. Prompt shipment to war industries.

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MACHINE TOOLS

DRILL PRESSES — HAND AND POWER FEED • RADIAL DRILLS
METAL-CUTTING BAND SAWS • POLISHING LATHES • FLEXIBLE SHAFT MACHINES
RADIAL CUT-OFF MACHINES FOR METAL • MOTORS • BELT & DISC SURFACERS

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FOR 2 WEEKS' DELIVERY

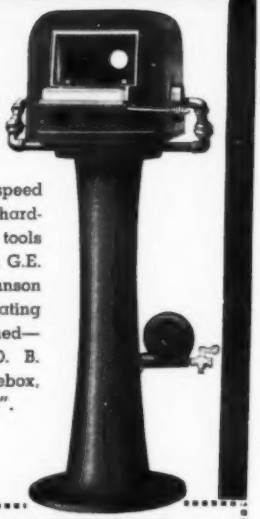
For Temperatures from 1400° to 2400° F.

No. 130A

Heat-treating furnace. Firebox 7¾" high, 13" wide, 16½" long. 4-burner job shown, $295 complete with motor and blower, F.O.B. Factory. 6-burner job, $325 F. O. B. Factory.

Offices in All Principal Cities

No. 120 Heat-Treating Furnace



Use with hi-speed steels, or for hardening dies, tools and punches. G.E. motor and Johnson blower. Insulating refractory lined—$129.50 F. O. B. Factory. Firebox, 5"x7¾"x13½".

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584 E Ave. N.W., Cedar Rapids, Iowa.

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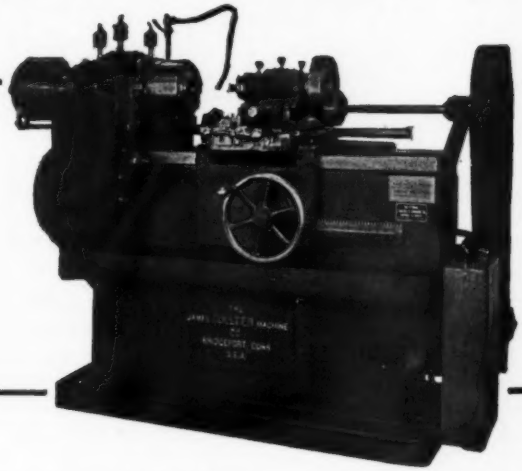
Keep Ahead of DEFENSE DEMANDS *on the PRODUCTION of* EXTERNAL and INTERNAL THREADS



The Coulter Type "H" Hob Thread Miller—modern in every detail of design and construction—handles high speed, accurate production of right or left hand threads. Any parts that can be held in ordinary chucks, air operated chucks, air operated collet chuck or special face plate fixture can be threaded on this machine.

Work holding spindle and cutter spindle are driven by individual motors through worm and gears. Speed changes to work spindle are accomplished by pick-off gears; cutter spindle speeds are controlled by variable motor sheave. All high speed shafts turn in anti-friction bearings.

Maximum external thread, 7"; minimum hole depends on smallest hob practical.

Send for Descriptive Bulletin giving full information.

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PERMANENCE!

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SAFETY!

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WINDERMERE MAGNETIC ADAPTER SHOWN CHECKING ALIGNMENT FROM RAM OF SHAPER.

Today, when speed and time are such vital factors in our Victory effort, the new Windermere Magnetic Adapter, weight approximately 1 lb. 4 oz., has joined in the fight. By speeding up essential war production through its many applications in set-ups on inspection, lathe, boring mill, shaper, etc., operations, the tremendous saving of time through the elimination of clamps, vises and special fixtures is incalculable.

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Properties of this new alloy are such that the magnetic charge in a 1-lb. magnet will lift 25 pounds of attracted metal. This power is retained indefinitely by the magnet, preventing any damage to work pieces or indicators. Dial indicators are not affected by magnetism from the Adapter.

Your complete satisfaction is guaranteed, as attested to by the many thousands in use throughout the essential war plants in America.

Inquiries for representation invited

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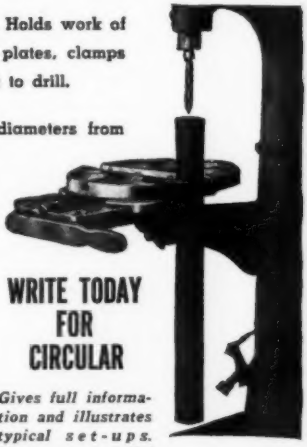
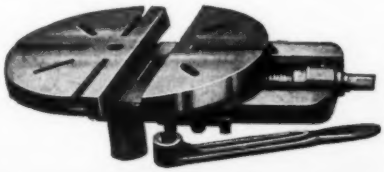
We will ship to rated concerns under this guarantee, on *free trial*. Should you decide not to keep the tool we will even pay return transportation

COMBINATION DRILL TABLE AND VISE

Simplifies the most difficult drill press set-ups. Holds work of all shapes securely. Does away with angle plates, clamps and supports. Just drop in the work and start to drill.

The Combination is made in various sizes—diameters from 8" to 27½", weighing from 27 to 600 lbs. Made of the finest materials, for long life. Easy to install. Specify the diameter of your shank in thousandths of an inch. We supply the drill table and vise with shank turned to size specified.





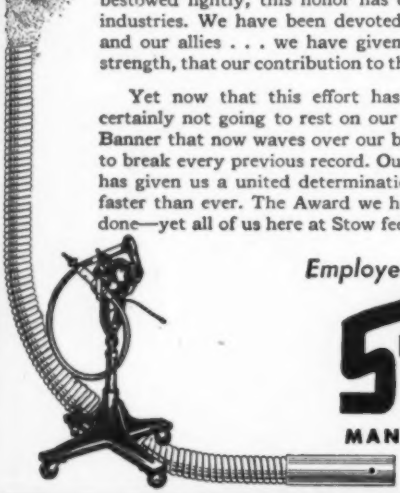
WRITE TODAY FOR CIRCULAR

Gives full information and illustrates typical set-ups. Shows use on radial drills. Complete specifications of all models including the square, all steel tables.

MODERN MACHINE TOOL CO.
Jackson, Michigan

★ Here at Stow we are justifiably proud to have earned the Army-Navy "E" for high accomplishment in War-Production. Never bestowed lightly, this honor has come to mean much to America's industries. We have been devoted in our obligation to our country and our allies . . . we have given to the limit of our skill and our strength, that our contribution to the needs of war could be the utmost.

Yet now that this effort has been recognized officially, we're certainly not going to rest on our laurels. No, the Army-Navy "E" Banner that now waves over our busy plant is a constant inspiration to break every previous record. Our common pride in this high honor has given us a united determination to achieve even greater results faster than ever. The Award we have won is a symbol of a job well done—yet all of us here at Stow feel that we have just begun to fight.



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MANUFACTURING CO.

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Faster metal sawing!

Check these features -

Metal sawing is no longer a problem for plant production men who rely on the Johnson Saw; the speed accuracy and efficiency of this machine make delivery schedules easier to meet. Quick set-ups; unlimited adaptability and flexibility for almost all cutting jobs. 3-point base compensates for uneven flooring. PROMPT DELIVERIES!

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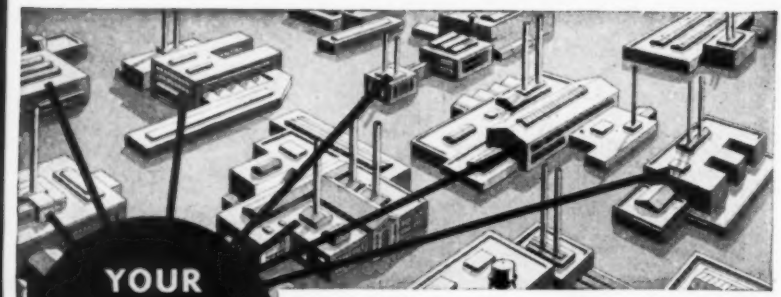
CUT PIPING!

CUT GIRDERS!

CUT SOLIDS!

JOHNSON METAL CUT-OFF BAND SAW

JOHNSON MANUFACTURING CORP. Albion, Michigan



YOUR I.S.D.*

"Next Door" to Guaranteed Delivery When you order through your I.S.D.*

Nobody can guarantee spot deliveries, of course. But your *Industrial Supply Distributor does the next best thing—he *anticipates* for you by ordering what you will need, ahead of the time you are going to need it.

He buys from many sources of supply, absorbing a lot of delays enroute and saving you clerical time and paper work. He buys on high priority as a rule. He buys for stock. That's why he can often say "Yes, sir—this afternoon, *sure!*"

Telephone your Industrial Supply Distributor INSTEAD of ordering materials or parts from the factory. You'll frequently find that this saves time for yourself—and avoids duplication and confusion—perhaps the very materials you need so urgently already are on the way to him on an order he placed weeks or even months ahead.

And you can buy from him with confidence always—we have been selling to him with confidence for many years. Try him FIRST for your needs in Cle-Forge High Speed Drills, Peerless High Speed Reamers, and other cutting tools we make.

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1242 EAST 49th STREET
CLEVELAND

FOR *Your* 1½"-8 THREAD SPINDLE
Lathes

FULL SPINDLE CAPACITY
NO STOPPING OF MACHINE
FITS LATHE, MILL & DRILL PRESS
NEEDS NO KEYS OR WRENCHES
UNSURPASSED FOR PRODUCTION
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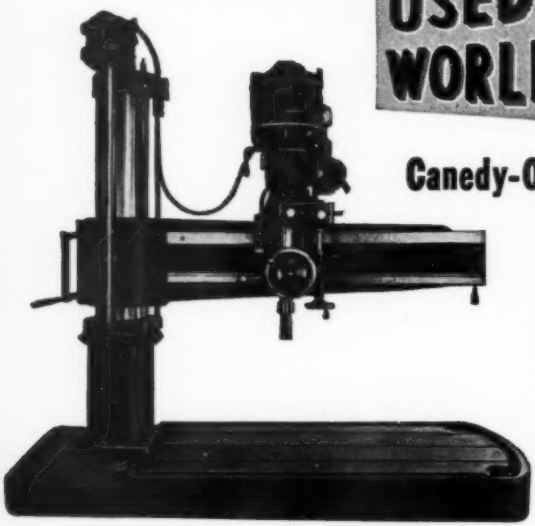


USED THE WORLD OVER

Canedy-Otto Radial Drill

Canedy-Otto has been the manufacturer of first-class, high-grade drilling units since 1892. These units are available in single spindle, multiple spindle and radial.

We can help you solve your drilling problems. Send for information on our complete line

Early delivery possible.

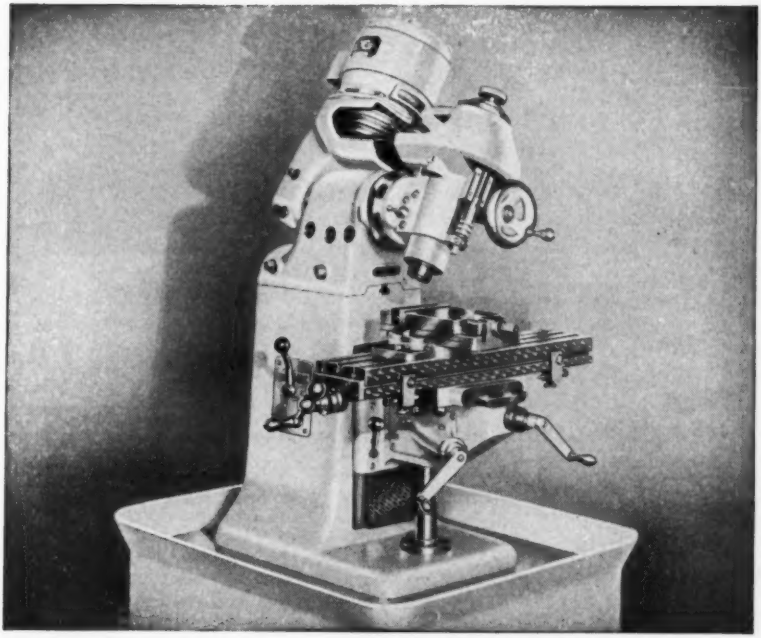
SPECIFICATIONS:

	9" Column 3' Arm	11" Column 4' Arm	11" Column 5' Arm
Drills to the center of circle on base or table	73½"	96"	120"
Length of arm	3'	4'	5'
Greatest distance from spindle to base	43⅜"	48"	46"
Minimum distance from spindle to base	9½"	15"	17"
Minimum distance from spindle to column	10½"	10"	10"
Traverse of spindle	9½"	9½"	9½"
Hole in spindle—Morse Taper	No. 4	No. 4	No. 4
Diameter of spindle at nose	2½"	2½"	2½"
Traverse of head on arm	25½"	30½"	48½"
Traverse of arm on column	21½"	24"	22"
Spindle speeds with 1200 RPM motor	(60, 85, 130, 180, (425, 560, 860, (1200 RPM		on all models
Spindle speeds with 1800 RPM motor	(85, 130, 180, 274, (560, 860, 1160, (1750 RPM		on all models
Feeds per revolution of spindle	(.004" .007" (.010" .020"		on all models
Bearing of arm on column	14"	16"	18"
Size of main driving motor	2 HP.	2 HP.	2 HP.
Height of drill column over gears	89"	98"	98"
Working Surface of Base	29"x45"	38"x60"	36"x88"
Net weight	4000 lbs.	6200 lbs.	7000 lbs.

CANEDY-OTTO MFG. CO.

CHICAGO HEIGHTS, ILLINOIS

ELGIN



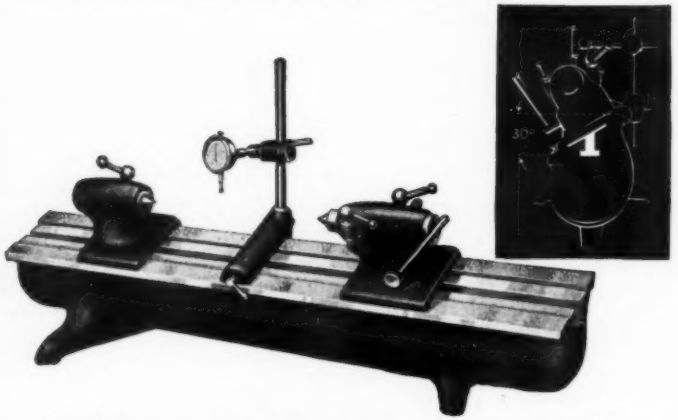
Precision

VERTICAL MILLING MACHINES

ELGIN TOOL WORKS

1772 BERTEAU AT RAVENSWOOD AVE. – CHICAGO, ILL.

WHAT! PROMPT DELIVERY of these BENCH CENTERS?



- INCLINED FACE — allows additional space for operator's hands.
- NEW DESIGN — improved box type bed; three feet, always solid on bench.
- ADJUSTABLE HEADS — work can be removed without changing adjustments.
- QUICK CHECK — dial indicator reads to thousandths; quickly set to position.

YES, if you can furnish reasonable preference rating, we can make delivery within three weeks of any size American Bench Center.

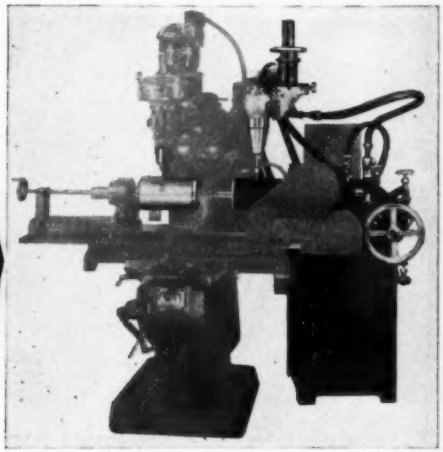
There are three sizes: 8"x36", 6"x24" and 4"x10". The 30° inclined face prevents its use as a "catch all" for tools. Work can be quickly adjusted in and out of centers. Dial gage is brought to fine adjustment by precision adjusting screw; swings out of position when work is removed. Ruggedly built for either inspection or production work.

Send for Bulletin No. 43-BB.

THE AMERICAN GAUGE CO.
125 Bayard Street DAYTON, OHIO

Turchan FOLLOWERS

INCREASED PRODUCTION OF THIS VITAL GUN PART... 500%!



This two-dimension Turchan Follower, mounted on a standard type vertical mill, is being used by one of the nation's largest ordnance manufacturers to produce fire control cams for aerial machine guns. And production of the cams—one of the most vital parts in the gun's entire mechanism — has been stepped up more than 500 per cent. We repeat: MORE THAN 500 per cent!

The cam enables our boys to "get the drop" on enemy airmen; shoot them out of the sky without danger of riddling one's own wing or tail surfaces. No thicker than a cardboard, they *have* to be delicately machined. Naturally, production of them was slow and costly—until the ordnance maker "turned to Turchan."

You, too, can increase your production — save time, money and reject worries by "turning to Turchan," the all-hydraulic duplicator. Turchans, you know, can be attached to any standard lathe, planer, shaper, grinder or mill. And they'll pay for themselves a thousandfold. Write today for our catalog.

TURCHAN FOLLOWER MACHINE COMPANY

Originators of Hydraulic Duplicating

8253 Livernois Avenue **Detroit, Michigan**

ARMY E NAVY

The TESTMASTER

REG. U. S. PAT. OFF.

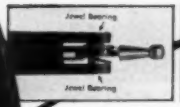
UNIVERSAL

DIAL INDICATOR

with the NEW

INDEX POINT

that locks in place and sets positively



Serrations mesh positively. Interchangeable point locks on pivot. Low friction bearings.

Crown gear reduces friction and inertia — greater accuracy.

Illustrations are actual size

For lining up and testing machine work the Testmaster is exceptional.

You get more quality features in this new FEDERAL Universal Test Indicator.

The Testmaster is chock full of features that you will appreciate more and more as you use it.

It is accurate. Its point swivels positively, works in either direction and won't come out unless you want it to. The universal clamp and dovetail slides make it handy. Its quality is worth more than the price. Write for circular.

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wears 'em down!

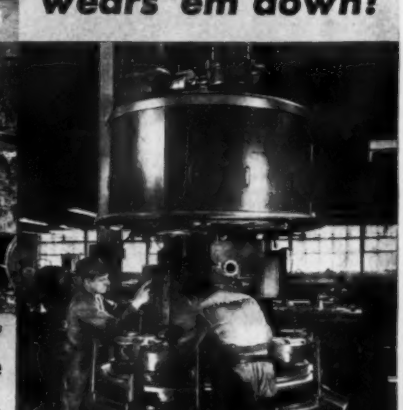


Photo by U.S. Army Signal Corps

machine tools, like tanks, need time out for repairs

The balance in battle often hangs on the ability to return damaged weapons to action faster than the enemy. ● This war's battles start on your production lines. Machine tools are your weapons. Operated twenty-four hours a day, often in semi-skilled hands, they undergo punishing wear and tear. As a result, they can develop more troubles in a single year of intensive day-and-night shifts than in a decade of normal production. ● Because replacement of these vital weapons is both difficult and time-consuming, you have a two-fold responsibility: to keep your machine tools at peak efficiency by preventive maintenance and to repair them speedily when they do break down. ● Simmons, specialists in rejuvenating metal-working equipment, has returned to production many hundreds of used machine tools of all types and sizes. This company has the facilities and experience to solve your rebuilding problem quickly. Ask for full details. Simmons Machine Tool Corporation, 1725 North Broadway, Albany, N. Y.

ARMY (E) NAVY

SIMMONS *Engineered* MACHINE TOOL REBUILDING

DON'T STOP SPINDLES TO CHANGE TOOLS!

Modern-Magic Quick Change Chuck and Collet Equipment has reduced the idle time of revolving spindle to practically zero. Tools can be changed without stopping or even slowing down the spindle. This gives practically multiple spindle range to single spindle machines.

Simple design and durable construction insure a long trouble-free life for this tool. It is extremely simple in operation. For complete information send for Bulletin M-101. It's free!

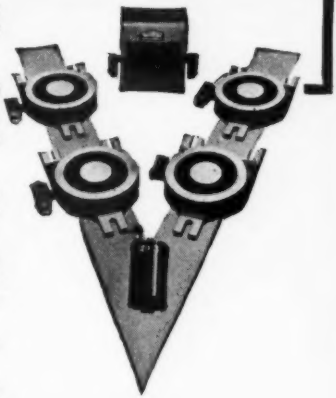
CONSOLIDATED MACHINE TOOL CORPORATION

MODERN TOOL WORKS

DIVISION

ROCHESTER, NEW YORK

THE NEW ARMOR PLATE MAGNETIC CHUCK



ESPECIALLY DESIGNED FOR BETTER HOLDING POWER, SPEED AND ACCURACY

TO ANDERSON & BROWN CO. came the call for a powerful, rugged, quick-acting, accurate, armor plate magnetic chuck.

HERE IT IS. It is Cast Steel, sizes ranging from 8" to 22" diameter. Magnetic penetration is 2¼", which is your assurance of intense holding power.

DESIGN ELIMINATES stray magnetic fields. Work is demagnetized as it is released.

WIDE APPLICATION—the 12" circular Anderson & Brown Magnetic Chucks shown may be applied to your grinders, planers or flame-cutting tables. These chucks are readily portable.

THE CHUCKS OPERATE in parallel on 6 volts d-c, supplied by the rectifier from any convenient 110 or 220 volts a-c line. No high voltage discharge and no inductive kickback—no danger of shock.

Send for Special Bulletin on ARMOR PLATE MAGNETIC CHUCKS

It's V for Victory

Anderson & Brown Co. offers its new Armor plate magnetic chucks for better handling of light, medium and heavy plates in our armored tank program.

STANDARD MODELS FOR DIFFICULT UNUSUAL SET-UPS

Speeds Production—
Eliminates Clamping—
Solves holding problems

"MAGNETIC BODY FLO" is the term applied to the magnetic principle involved in holding work with the ANDERSON & BROWN Magnetic Chuck. The magnetic flux flows through the work, the parallel, and back to the Magnetic Chuck through the working surface, locking and holding all elements tightly together.

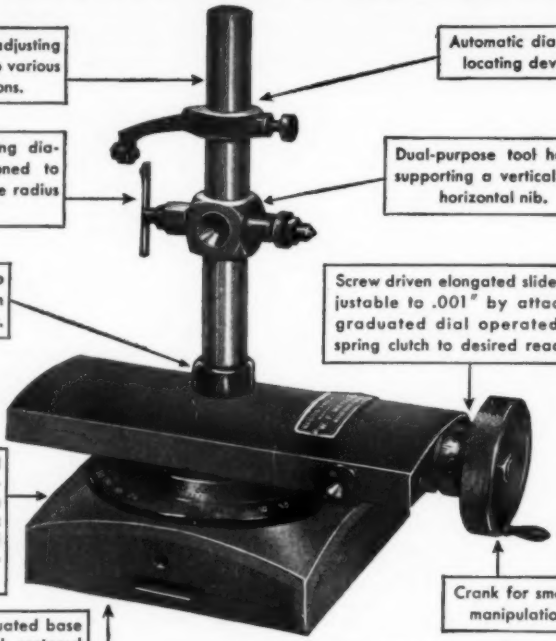
CHUCKS ARE PORTABLE; sizes for large or small grinders, planers and shapers.

Send for "Magnetic Chucking Revolutionized"

ANDERSON & BROWN CO.

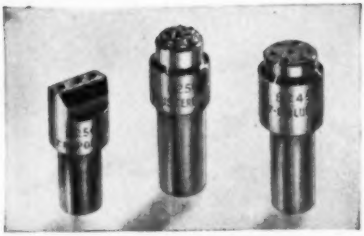
2036 East 22nd. St. Cleveland, Ohio

SPEED PRECISION GRINDING


Upright shaft for adjusting diamond holder to various vertical positions.
Automatic diamond locating device.
Adjustable swinging diamond tool fashioned to outline full concave radius of 180°.
Dual-purpose tool holder supporting a vertical and horizontal nib.
Locking screw to hold swivel platen in desired position.
Screw driven elongated slide adjustable to .001" by attached graduated dial operated by spring clutch to desired reading.
Vernier graduated swivel platen insulated for rotation on magnetic chuck forms convex and concave radii outlines.
Crank for smooth manipulation.
Ball bearing graduated base platen slotted and centered for flexibility of installation is simply and quickly mounted.

MEYERS "DIA-BRASIVE" Radius-Angle Former Eliminates Lost Motion

Engineered for absolute precision, this Meyers tool gives speedy, precise and economical shaping and truing of grinding wheels—from any angle. Difficult radial and angular outlines quickly formed. Easily installed on various machines. Vertical and straight diamond dresser nibs are standard equipment. Write for literature. Manufacturers representatives wanted in East, West and South.



Multiple Diamond Point Dressers
Efficient—economical. Small stones cost less, and remain sharp longer. Numerous sharp points are always exposed to work, or face of wheel. New points secured by turning dresser a quarter or half turn. Special dressers made to order.

W. F. MEYERS COMPANY, Inc., Dept. M, Bedford, Ind.

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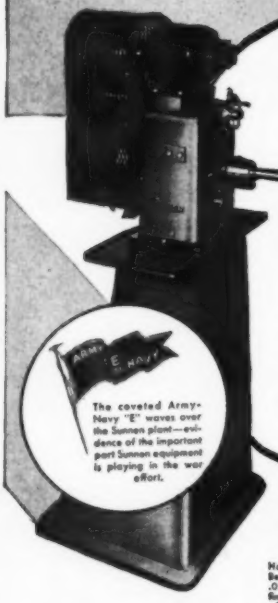
that provides ACCURACY * INTERCHANGEABILITY * SUPER-SMOOTH FINISH



The coveted Army-Navy "E" waves over the Sunnen plant—evidence of the important part Sunnen equipment is playing in the war effort.

All of the care and skill used in previous operations—all of the vital materials used and the precious man-hours invested—are subject to costly waste if *that last operation* of honing or finishing is not one of dependable accuracy.

That's the reason manufacturers of precious combat equipment and munitions have been quick to adopt Sunnen Precision Honing.

For here—in a small, inexpensive, economical-to-operate piece of equipment is the method that assures interchangeability of parts and fewer rejects, thanks to a guaranteed accuracy of .0001" and a super-smooth finish of 2 to 3 micro inches.

This machine will handle any internal diameter from .185" to 2.400". No jigs or fixtures necessary. Can be set up in less than a minute. Skilled labor not needed.

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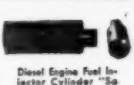
Hardened Steel Inner Bearing Race honed to .00005" limit. Surface finish improved; errors of out-of-roundness eliminated.



Diesel Engine Fuel Injector Cylinder "So accurate that a piston can be fit within .00005 inch."

"Strict alignment maintained between two holes."

Drill Jig Bushing "Increases sales appeal of product."

Aluminum Aircraft Link "produces high finish without ball-mouthing."

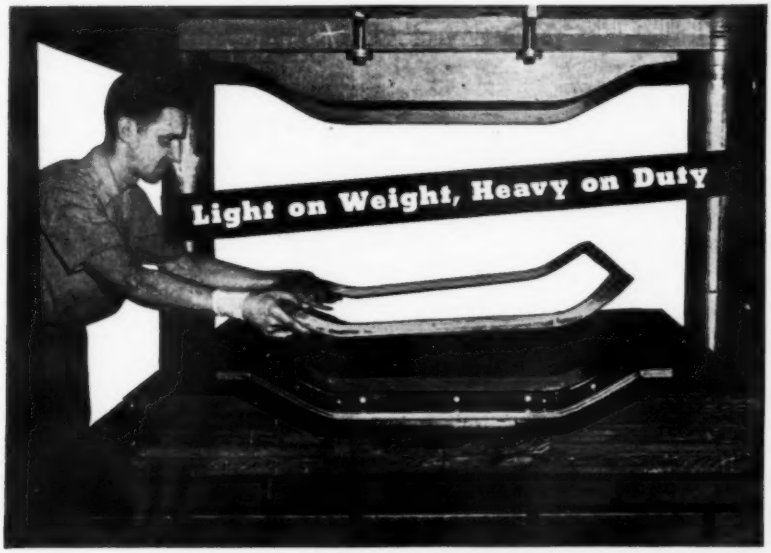
Inner Bearing Ring "Accurately removes last 'tenth' of stock."

Aircraft Valve Tappet Roller. 4-Micro finish.

Drawing and Blanking Die "Saves time in producing smooth base metal finish."

Bronze Valve. The Sunnen method of honing is used to secure a high finish and accuracy.

Cones for Wheel Balancing Machine "Accurately align bores two interrupted surfaces."



• Deep-draw mating die of Masonite* Die Stock, used to produce hatch coaming part for Martin Patrol Bomber.

YOU'LL be surprised—and pleasantly—with Masonite Die Stock . . . how a material so light in weight stands up for heavy-duty production runs.

Although only one-sixth the weight of steel, Masonite Die Stock has great compressive and flexural strength . . . is easily handled by pattern or tool maker . . . saves time, cuts fabricating costs.

This amazing semi-plastic material is popular in aircraft production, being used for shearing, forming, and shearing and forming in one operation, and also for router templates, drill jigs and assembly fixtures. For thicknesses greater than those available, Masonite Die Stock can be laminated with cold setting Urea-Formaldehyde glues.

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ARMY (E) NAVY

MASONITE CORPORATION
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Please send me illustrative literature and complete information about Masonite Die Stock.

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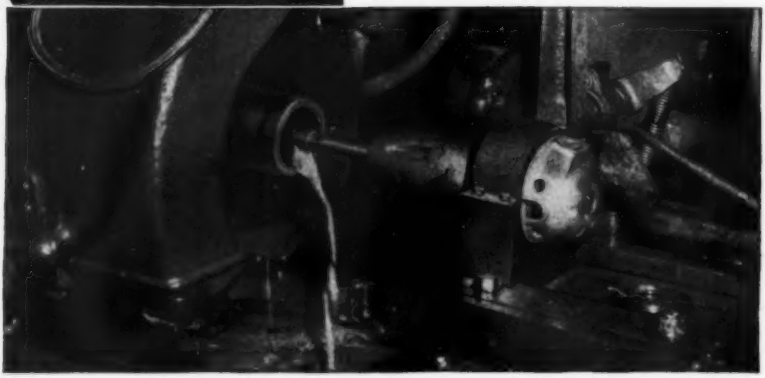
NEW METHOD FOR LAPPING CARTRIDGE DIES with Reciprocating Tool



A new and perfected method of lapping cartridge dies has been developed. This is accomplished by the use of a diamond wheel, mounted on a spindle which is held in the chuck of our reciprocating tool. The tool is then mounted in a cradle which sets on the bed of the machine. By throwing the switch on, the reciprocating tool will then give approximately 1,200 to 1,400 strokes per minute. This reciprocating action, combined with the rotating motion of the die, which is held in the chuck of the machine, gives the desired lapping operation. In addition to the reciprocating action of the tool itself, an oscillating motion is also obtained when the tool moves on the bed in a forward and backward motion.

A typical setup for the fine finishing of dies is shown herewith. A 500 grit Norton diamond resinoid wheel is used. This wheel does not revolve, and is applied in the same manner as a honing stick with light pressure.

The device operating the wheel is our Portable Electric Honing Tool which gives the reciprocating action, and has a ⅛" stroke.

By this finishing method, plants have been able to obtain surface finishes better than 3 micro-inches R.M.S., in a matter of a few minutes. It is the combination of the rotating and reciprocating motions that gives this fine finish in such quick time.

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PROMPT DELIVERIES.

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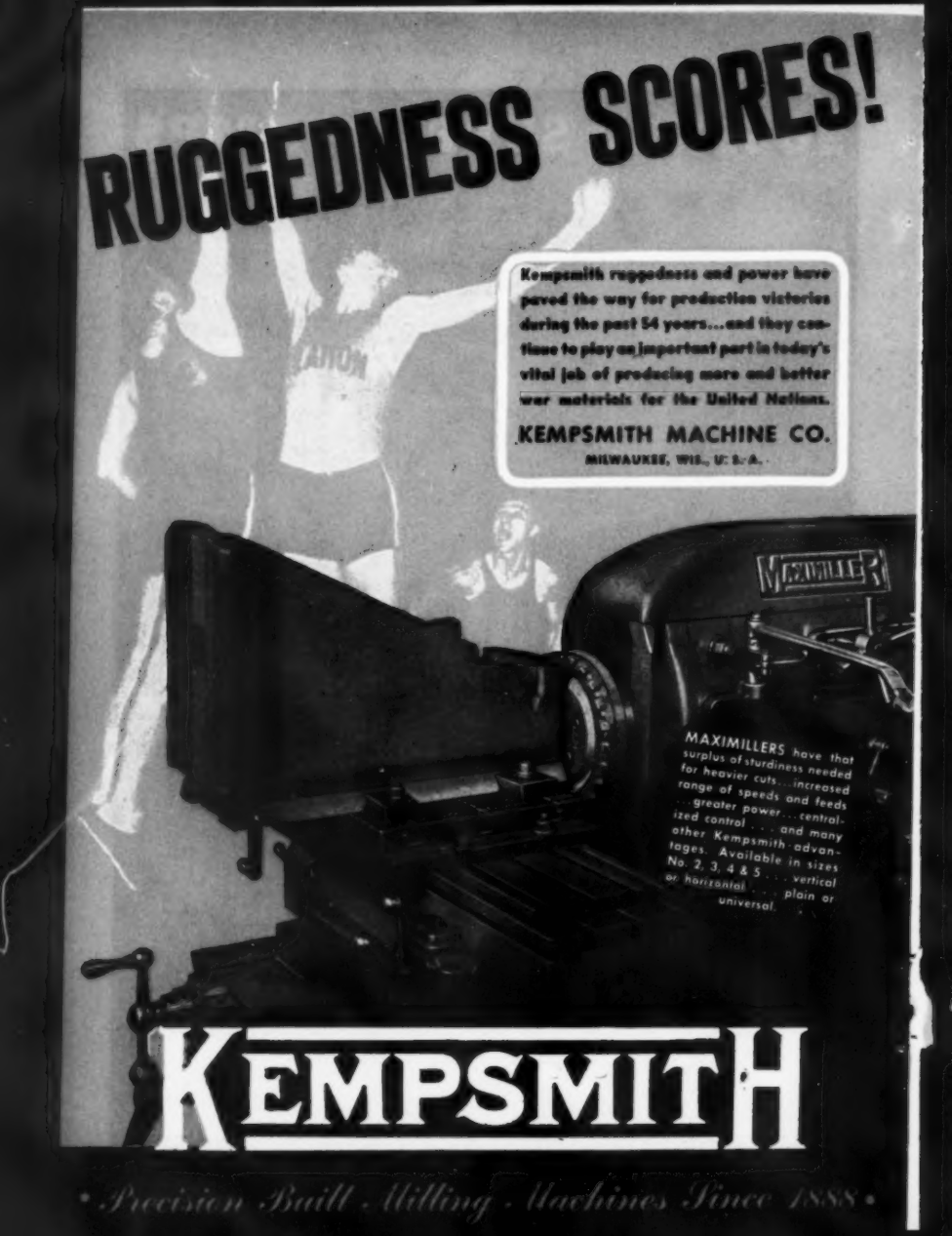
RUGGEDNESS SCORES!



Kempsmith ruggedness and power have paved the way for production victories during the past 54 years...and they continue to play an important part in today's vital job of producing more and better war materials for the United Nations.

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MILWAUKEE, WIS., U. S. A.

MAXIMILLERS have that surplus of sturdiness needed for heavier cuts...increased range of speeds and feeds ...greater power...centralized control . . . and many other Kempsmith advantages. Available in sizes No. 2, 3, 4 & 5 . . . vertical or horizontal . . . plain or universal.

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Better Tool Room Grinding SPEEDS War Production

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ABRASIVE COMPANY

Standard Specifications

Tool Room Grinding Wheels

Broaches	W60- J- KY
Cutters	W46- K- HY
Die Blocks	W46- G- KY
Drills—Small	60- M- DY
Drills—Large	36- M- DY
Gears	W60- J- K8
Hobs	W60- J- K9
Machine Shops	
General Offhand	46- M- DY
Reamers	W46- J- HY
Stellite Cutters	W46- J- HY
Tools	
Lathe and Planer	
Light Offhand	46- M- DY
Heavy Offhand	46- N- D9
Heavy—Large Wheels	30- O- D9
Fixture Grinding	W46- J- HY
Tungsten Carbide Tools	
Roughing—Offhand	G601- I- V9
Semi-Finishing—Offhand	G80 -H- V8
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Write for copy of our Grinding Wheel Data Book.

Follow these suggestions for better grinding results in your tool room. Your cutting tools are vital production tools for war production. By keeping them at peak efficiency you are speeding production of the materials of war!

1. ***Sharpen tools and cutters frequently*** . . . before the cutting edges become too dull . . . otherwise you waste time and metal in renewing an overly dull edge.

2. ***Use fine grain abrasive wheels*** . . . for finish grinding the cutting edges of milling cutters, hobs, reamers, broaches, lathe and planer tools, etc. . . . to obtain keener edges that last longer.

3. ***Do not quench a hot tool edge in water*** during offhand tool grinding. You will check and crack the cutting edge.

4. ***Frequent dressing and truing of the wheel face*** permits best precision grinding. However, excessive dressing wastes the abrasive wheel.

5. ***Use open-density wheels*** for grinding the newer, tough alloy steels after heat treating. The open-density wheels have a wider grain spacing which provides chip clearance for the abrasive cutting particles.

6. ***Use the proper grain and grade of abrasive wheel*** for your work. ABRASIVE COMPANY "white" and "red" Tool Room Grinding Wheels have been standard for many years for all types of tool and cutter grinding. Use the one *best suited* to your job.

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Official OWI Photo by Palmer

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You'll find these SKILSAW TOOLS *preferred* in war plants everywhere because they're lighter, more compact for easier handling . . . more powerful for greater output per man on countless jobs. Ask your distributor to demonstrate SKILSAW TOOLS on your own work . . . *today!* You'll see how greatly these better tools will increase *your* production!

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★ MAKE AMERICA'S HANDS MORE PRODUCTIVE ★

Featured In This Issue

BIG MARINE GEARS—and the precautions necessary to maintain accuracy in cutting them—air conditioned rooms and batteries floating on the line to insure continuity of operation—these are some of the points discussed by M. Kennedy in the story commencing on page 107

INDUSTRIAL POWER SYSTEMS have been revised and modernized in several important respects. D. L. Beeman discusses the latest trends and equipment in the article commencing on page 117

FOREMANSHIP FORUM, conducted by Edmund Mottershead, discusses Breaking the Supervision Bottleneck. The qualities and elements essential for efficient supervision are described, along with a method of evaluating the same, in the story commencing on page.....129

FREE MACHINING INVAR, recently developed by the Carpenter Steel Co., is introduced in a brief story, along with pictures and facts. See page.....153

SMALL MACHINE TOOLS and the methods of production are described in a new series of articles by H. A. Frommelt, commencing on page.....163

HYDRAULIC DUPLICATING EQUIPMENT by John T. Neville, tells about some of the latest Turchan developments in the field of hydraulically controlled machining processes. See page 168

PREVENTIVE MAINTENANCE stresses some of the simple precautions which can be taken to keep electric equipment in tip top condition—a very necessary consideration in these days of forced war production. The common ailments of motors, generators and control equipment are analyzed, with hints on proper care. See page.....178

WIRE RETAINERS and Snap Rings is the continuation of a series of articles by H. F. Williams. He describes additional types of snap rings and retainers along with hints as to their use. See page 199

WOMEN and War Production presents some interesting angles on the increasing employment of the fair sex in shop work. The Westinghouse plan is outlined and some opinions of a General Electric personnel official are given, in the story beginning on page.....227

CENTRALIZED TOOL GRINDING explains the advantages of concentrating the carbide tool grinding in one or more shop locations—where proper facilities are available, and the men soon become experts. The story is by M. E. Knoll, and begins on page.....219

LET'S TALK SHOP is the regular Shop Notes Section, and it offers helpful and constructive suggestions on a number of important subjects. This section begins on page.....237

NEW TOOLS and Equipment presents the monthly parade of new items in the industrial field—new tools, new accessories, new ideas and new methods, in the section beginning on page.....264

MECHANICS THRU THE AGES—Blue Book's exclusive picture page....374

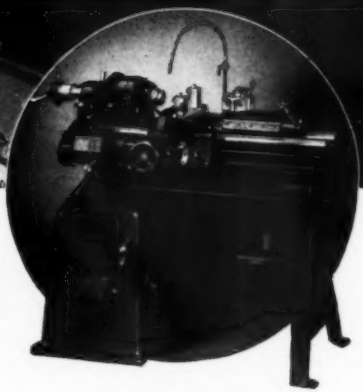
The Wounded Can't Wait!
Give NOW to the
American RED CROSS

RAPID MACHINING

with *Precision*

on South Bend Series 1000

TURRET LATHES

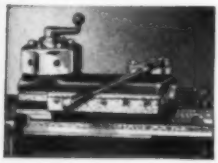


Rapid machining *with precision* is easily accomplished in shops that are equipped with the new South Bend Series 1000 Turret Lathes. Designed for manufacturing small accurate parts, they have the stamina to maintain exact tolerances on volume production without sacrificing speed or versatility.

These Turret Lathes are especially suitable for second operation work. The basic South Bend features that insure efficient production are supplemented by the handlever operation of the turret, cross slide, and collet attachment to speed up machine operation and lessen operator fatigue.

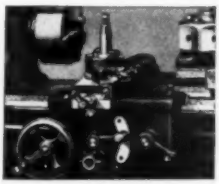
SPECIFICATIONS

Hole through spindle	1⅜"
Collet capacity, round	1"
Swing over bed and saddle wings	10½"
Spindle speeds, (12)	50 to 1357 r.p.m.
Effective feed of turret slide	4"
Thread cutting range, (48)	4 to 224 per in.



HANDLEVER TURRET

Permits rapid positioning of turret tools. Turret indexes automatically on return stroke. Equipped with adjustable stops.



UNIVERSAL CARRIAGE

Provides wide range of feeds—48 power longitudinal feeds—48 power cross feeds—48 threading feeds, 4 to 224 per inch.

SOUTH BEND LATHE WORKS

SOUTH BEND, INDIANA — LATHE BUILDERS FOR 35 YEARS

As The Editor Sees It

THRUOUT the country, there must be vast quantities of dormant perishable tools — valuable cutting tools of all types and kinds that are not being used.

Perhaps these tools are no longer needed because of contract completions, curtailment of output or changes in design of the end item produced. Some may even be left-overs from peacetime manufacture of civilian goods.

These tools represent many priceless man-hours of highly skilled workmanship plus tons of important strategic materials.

It's hampering the war effort to hold these surplus tools idle in factory cribs when so many of them are sorely needed by manufacturers of war materiel. In many instances, important war production is being delayed for lack of some of these dormant tools.

Ordnance Districts thruout the country are striving for a solution of this problem. One phase of their activity has been to act as a clearing house for surplus tool inventories.

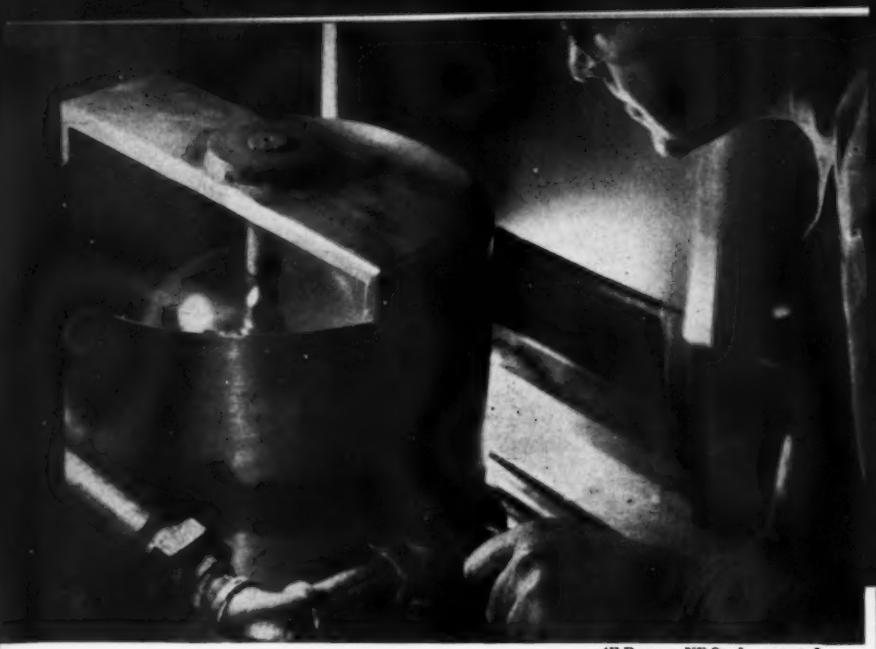
You can help hasten victory by digging out the surplus tools in your plant, no matter how insignificant the pile may seem, and reporting them to the Ordnance District Office in your vicinity.

Also ask your Ordnance District Office about salvaging any tools that cannot be used in their present state.

You can help smack the Axis by throwing your dormant surplus tools into the fight.

Wesley G. Paulson

(P. S. — This appeal was requested by Arthur C. Pletz, Chairman, Cutting Tool Panel, Cincinnati Ordnance District.)



All Ryerson NE Steels are tested.

NE Alloys in Ryerson Stock

Representative stocks of NE (National Emergency) Steels are available at Ryerson for prompt shipment. Each heat is carefully tested. This test information is passed on to customers with each shipment.

Additional information on NE Steels is contained in a booklet just published by Ryerson. It includes physical property data for thirty NE Steels, an explanation of Jominy End Quench Hardenability Testing and its interpretation in terms of tensile strength, yield point, elongation and reduction of area. Call or write for your copy.

Write for New Booklet

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RYERSON STEEL–SERVICE

Big Marine Gears Require Precision

By M. Kennedy*

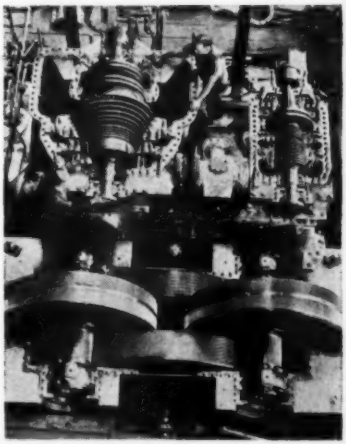
THE immense physical size of marine propulsion gearing means that it must be extremely accurate. A second reduction or "Bull" gear for an 8500 shaft-horsepower ship, the Maritime Commissions C-3 design, is 146" in diameter, or approximately twice the height of a tall man. Its two helices are each 18½" wide and are separated approximately 24". The extremities of the teeth are over 60" apart.

To maintain tooth contact in a gear set of this proportion, shafts of the mating gear and pinion must be parallel, and the gear faces must be parallel to their respective shafts. In correctly machined set of C-3 gearing, nine teeth are in mesh between the Bull gear and its mating pinion in each helix. Each tooth of the gear picks up approximately 1/18th of the total torque load as it meshes. This load is transferred from one end of the tooth to the other as the gear revolves.

If there are inaccuracies in the parallelism of the shafts or faces, or in the teeth, the load on the teeth will be unequally distributed; some teeth or portions of them will mesh lightly, or not at all, and others will be loaded in excess of their designed capacity. The result of slight inaccuracies may be evidenced by pitting or scaling of the overloaded tooth face. Extreme inaccuracies result in noise and in some cases tooth breakage.

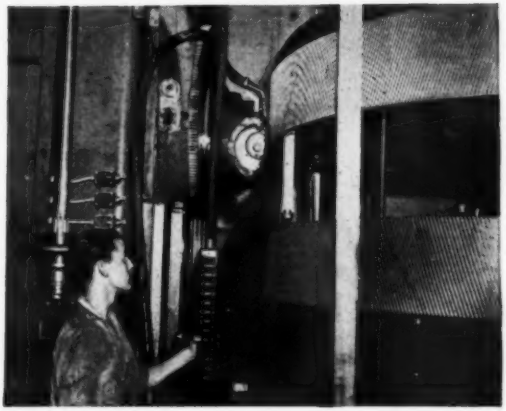
The Maritime Commission requires that the C-3 gearing be designed so that under normal load, the tooth pressure shall not exceed 60 pounds per inch of face per inch of pinion diameter. This is regarded as a conservative figure, but inaccuracies in machining may result in instantaneous pressures two or three times the designed figure.

Obviously, the tools used in the manufacture of marine gear units must be the most accurate obtainable. This is particularly true of the lathes on which the gear blanks are turned, the boring mills which bore the housing fits for the



Assemblying a typical marine turbine drive unit, showing high-pressure turbine (rear right); low-pressure turbine (rear left); and reduction gears.

*Merchant Marine Division, Westinghouse Electric & Mfg. Co.



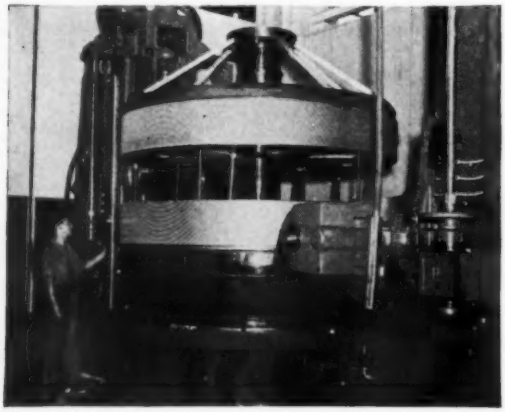
Close-up of cutting big gears in the air conditioned room.

bearings and the gear hobbers which generate the teeth. Of these three tools, the gear hobbers offer the greatest problem because of the complex design.

The hobbers themselves are marvels of accuracy. The 60" vertical slides for the hob carriers are so carefully hand scraped that the hob does not vary two ten-thousandths of an inch, to or from the table, thruout the entire face of the gear to be hobbed. Even the perfection of the machines is not sufficient safeguard for accuracy, as a 146" gear will expand nine-thousandths of an inch in diameter with a temperature change of only 10° F.: if the hobbing operation started at a temperature of 70 F and finished at 90 F the hob would be .009" deeper in the gear at the end of the cut than at the start.

Air Conditioned Hobbing Machines

Air conditioning of a huge shop is within the range of possibility, but hardly justified when most operations



These two big "bull gears" are cut with extreme accuracy in an air conditioned room on a double-cutter machine. It requires more than 300 hours to cut the teeth.

POP'S JUST READ "FILE FILOSOPHY"★

PLAYFUL AN' DOPEY ARE AT IT AGAIN! - LONG ON PATRIOTISM, BUT SHORT ON TOOLCARE-ISM--
LETS PIN HIJO'S EARS BACK!
HERE'S ANOTHER STAB IN TH' EAR FOR THAT STAB IN TH' BACK, TOOTS!
WAIT'LL POP SEES TH' FILES THEY'RE ABUSIN' ARE NICHOLSONS! THESE HERE PRODUCTION GREMLINS WILL THINK A FLOCK OF NAZI STUKAS HAVE LAID EGGS IN THEIR HAIR!

• FREE. *Send for set of cartoons like this for your Bulletin Board*

SAYS Pop the Foreman, "Show me a mechanic who is careless with tools and I'll show you one who is careless in his work."

Because a file has to be tough enough to bite castings, hard steels and what-not, it is too often assumed that it is immune to injury or abuse. Wrong.

Modern file teeth are designed for use on certain types of metal; to contact the metal under correct pressure on the forward stroke and little or none on the back stroke. When used contrary to this elementary formula, the teeth become prematurely dulled or chipped, and the file's serviceable life is shortened—perhaps by many thousands of strokes. But when used properly, a file can withstand an amazing amount of work-punishment.

And *improper* care is second only to improper use in file destructiveness. Neither is any way to conserve the tool steels so sorely needed for the nation's war effort. Both can be effectually lessened through a study of Nicholson's new book, *"File Filosophy."*

★**FREE to Production Heads**—Not only does *"File Filosophy"* dwell liberally on the proper use and proper care of files, but it is an invaluable help in selecting *The right file for the job.* Many other interesting things are disclosed about files in this new book's profusely illustrated 48 pages. Send for your copy—free to executives, purchasing agents, shop superintendents, foremen and key mechanics.

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NICHOLSON FILES
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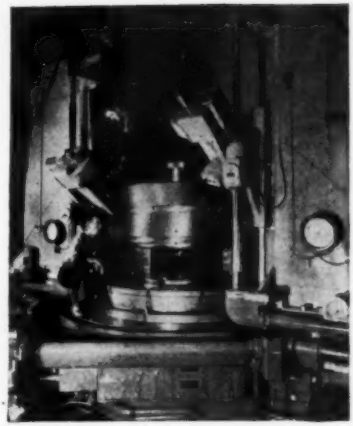
are not affected by temperature variations. Temperature of the gear hobbers and the gears must becontrolled tho, if accuracy is to be obtained.

In a clock pendulum escapement, expansion of the pendulum rod can be compensated, by use of materials of different expansion coefficients, so that over a wide range of temperature the center of mass of the pendulum is at a constant distance from the pivot. Compensation of this character can be used only in a simple mechanism. In a gear hobber the large number of complex parts eliminates possibility of compensation.

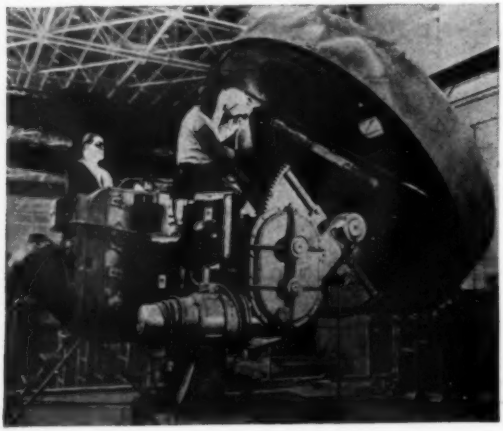
At the Westinghouse Merchant Marine Plant, each of the hobbing machines is enclosed in an air conditioned room and the temperature is maintained between 68 and 70 F. Temperature of the gear being cut rises above room temperature as the first few cutting revolutions progress. This generated heat is partly carried away by an oil flush and partly distributed thru the gear so that the temperature remains constant thruout the cut, even tho above the room temperature.

Portions of the hobber, particularly where the moving parts are carried in bearings, change temperature with operation. As in the case of the gear, these parts reach and maintain constant temperature while teeth are being generated in a gear.



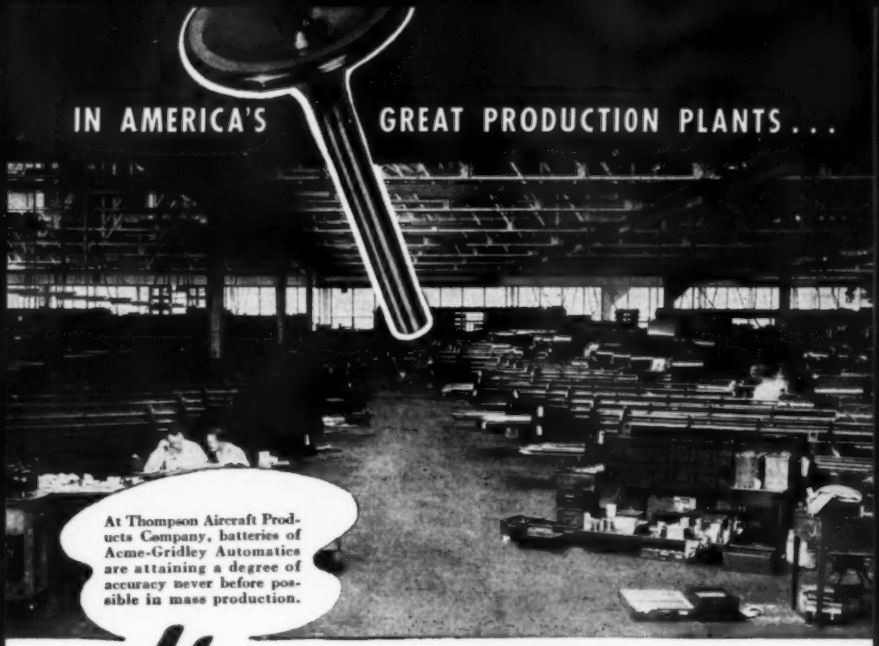
Marine reduction gears are cut with the greatest precision in air conditioned rooms at several Westinghouse plants. Once the tooth-cutting operation is started, it may continue without stopping for seven days at constant temperature to insure the utmost accuracy.

The finishing cut is the critical peri-



Welding a big gear blank. Fabricated construction has greatly reduced the weight of big turbine gears. The electrically controlled positioner turns the work so all welding is down-hand.

IN AMERICA'S GREAT PRODUCTION PLANTS . . .



At Thompson Aircraft Products Company, batteries of Acme-Gridley Automatics are attaining a degree of accuracy never before possible in mass production.

Millions of Parts - QUICK!

Two and three times faster than they have ever been produced before, metal parts in great variety, machined with the utmost precision—those are the demands of a war production greater than any nation has ever met!

Acme-Gridley Automatics are turning out these parts, at speeds and feeds limited only by the capacity of tools to stand up under 24-hour schedules.

These 4, 6 and 8-spindle machines are quickly adapted to many classes of work, often as many as 20 operations on a single set-up. Large tooling area speeds setting up. Operation is convenient, output is uniform, costs are low.

And when industry goes to work on the growing backlog of peace-time needs, Acme-Gridleys will be ready to carry their full share of the load—at lower costs than ever before.

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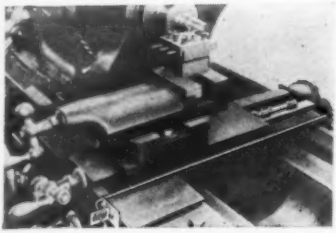
Automatic Cross-Feed
JACOBS
Precision Lathe Control



STEP UP WAR PRODUCTION WITH THIS LATHE CONTROL

Installing a Jacobs Cross-Feed Control on your production lathes will greatly increase their output and accuracy. The most accurate, fast and simple cross-feed control ever developed for engine lathes. It will pay for itself in a short time through faster work, less rejects and permit close tolerance production by less experienced operators.

Don't delay. Write for complete descriptive literature.

The Jacobs Wind Electric Co.
Industrial Division
MINNEAPOLIS, MINN.

od in cutting a gear. Fully 125 hours of continous operation is required for the finish cut on a Bull gear helix having 693 teeth, a hob diametral pitch of 5 and an 18½" face. If the machine stops during that period, the gear may be ruined. When the hobber stops cutting, the gear changes temperature, gradually cooling and contracting until room temperature is reached. In some cases, it is possible to save such a gear by withdrawing the hob and starting the cut at its beginning. The salvage of such a gear depends upon how close to tolerance the original cut was running.

Naturally, every possible precaution is taken to avoid stopping the machine during the finishing operation. The power source is d-c with a storage battery, placed as close as possible to the machine, floating on the feed line. In case of a power failure,the battery supplies current and the hobber continues to cut without a second's interruption.

While the prime purpose of the air conditioned rooms surrounding the hobbers is to maintain constant temperature, it is also advantageous in maintaining constant humidity. With wide fluctuations in temperature and humidity that are encountered in the Philadelphia area, condensation can cause considerable corrosion of finished surfaces. A gear, colled by low temperatures of a Spring or Fall evening, can become dripping wet during a succeeding hot humid day. A completed gear is slushed to avoid damage from this source. During the hobbing operation, if carried on in the open, corrosion might occur on one helix while the other was being cut.

An accurately hobbed set of gearing needs no lapping, scraping or grinding, but the degree of accuracy must be superlative if, in regular production, no final finishing whatever is required. In the Merchant Marine Plant, many gears have been machined that have not required lapping, and those that have required this operation have needed a very small amount of correction.

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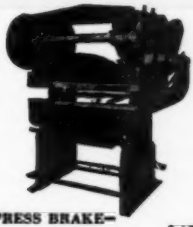

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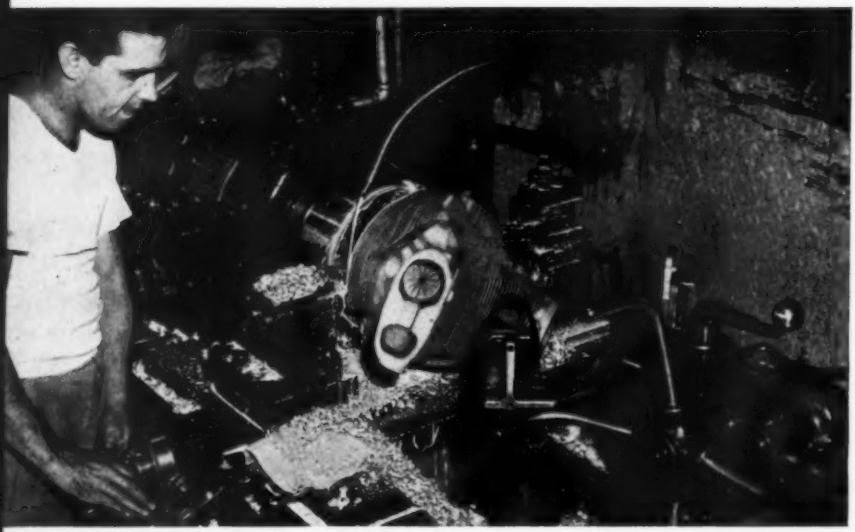


Photographs by courtesy of Wright Aeronautical Corporation.

This operation consists of rough-turning, facing and back-facing a cylinder head flange. The cylinder head is gripped in an air chuck on a rough surface. Alignment of the head is checked with a special fixture in the tailstock. The capstan handwheel permits quick movement of the fixture to and from the work. Tool blocks, designed for the job, on front and rear of cross slide, hold the turning and forming tools. Part of the operation is done with the front tools, then the feed is reversed in the apron; the slide traversed so that the rear tool does its operation, with power feed, and working to the automatic diameter stop. Production figures are censored, of course, but you'd be amazed at the number of cylinders these operators turn per shift, on this Monarch 18" Model BB Lathe.

SAVES NEW MACHINE TOOLS

Instead of waiting for special machine tools, this manufacturer teamed up his ingenuity with the Monarch representative's knowledge of what Monarch lathes could do. Together, they came up with solutions that have much to do with the speed of our aircraft engine production. Details of how Monarch lathes have been adapted to unusual duties are given in the picture captions.

This kind of careful job analysis may be helpful to you, too. Often, it is possible to adapt our standard engine lathes to work which may, on routine inspection, call for some other type of tool. Precious production time is thus saved . . . and equally important, machines are released for other work.

If you think a Monarch representative, with his knowledge of what Monarch lathes can do, might help you step up production of your war work, we are at your command. At Monarch, such service is the "order of the day."

THE MONARCH MACHINE TOOL COMPANY • • • SIDNEY • OHIO

MONARCH LATHES

COVER THE TURNING FIELD

This operator finish-turns and finish-faces cylinder head flange. The head is threaded on an adapter plate, which is mounted on a tee-slotted and balanced face plate. A special tool block, holding a tungsten carbide tool in front, is fed in under power feed to an automatic diameter stop, facing and forming the upper diameters.

PERIODIC LUBRICATION
PROPER ALIGNMENT
BIG FACTORS IN IMPACT WRENCH PERFORMANCE

4 Simple Maintenance steps keep Pneumatic Wrenches on the job

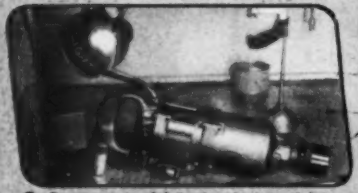
Because of their sturdy construction, slow motor speed and fewer parts (no springs or gears), CP Pneumatic Wrenches (impact type) give long service under severe conditions with a minimum of repairs. But, they will give even better service if they are given a little precautionary care.

Here are four simple maintenance steps for your CP 365-R Pneumatic Wrenches. Do these things regularly and you will keep your wrenches on the job, cut repair time to the minimum and conserve strategic materials. Suggestions for the care of other sizes of CP Pneumatic Wrenches (impact type) will follow shortly.

HOW TO GET MAXIMUM SERVICE FROM YOUR CP 365-R PNEUMATIC WRENCH

1 Check the air screen at least once a week. Clean it with an air hose. A dusty, dirty air screen will rob your wrench of power.

2 At the beginning of every shift, check the through bolts and nuts on tool housing and motor housing. Be sure all nuts are tight.



3 Proper motor lubrication is essential to good wrench performance. Fill reservoir every day with a good grade of light oil.

4 Once each week, lubricate the 365-RP wrench with a grease gun. For the best results, use the CP Impact Wrench Grease.

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AIR COMPRESSORS
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RECENT ADVANCES
in Industrial Power Systems

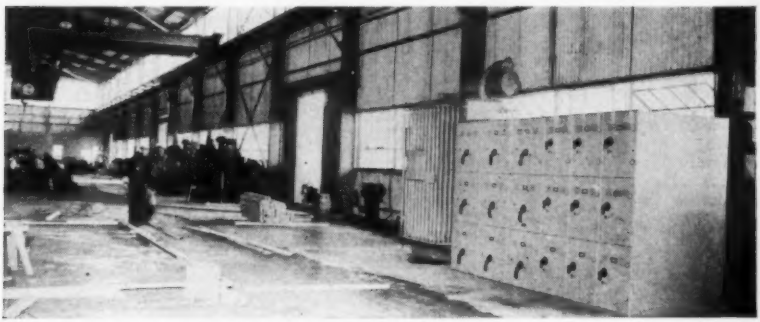
By D. L. Beeman*

THE role of electricity is an indispensable one of the hundreds of new war plants constructed during the past year and a half—the greatest era of industrial expansion this country has ever known. Electric power is called upon in these new plants to drive nearly all of the machinery in thousands of processes leading to the finished war product. It contributes greatly, too, in helping furnish those services provided for the health and efficiency of employees.

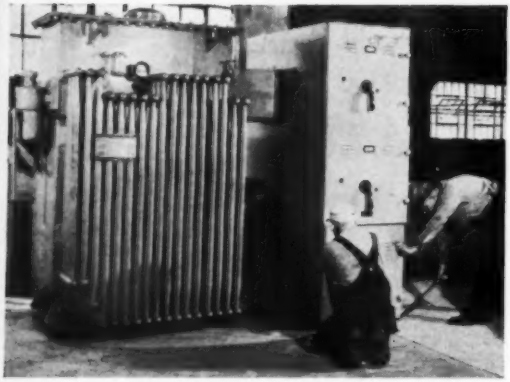
In view of the great expansion of facilities and the necessity for the utmost speed in their completion, it was quite natural, therefore, that investigations be made to determine how best to distribute electric power from the source to the utilization devices such as motors, furnaces, welding equipment, to mention but a few. In designing a power distribution system it was important to keep in mind many factors such as material used, installation time, flexibility, and reliability.

Many new ideas and products which had come into prominence at about the time the war program got under way were of immeasurable assistance in enabling the nation's production facilities to produce material so quickly and in such great quantities. In like manner, power distribution principles and products evolved over the past few years helped considerably in providing a distribution system that has met with the widespread approval of consulting engineers, architects, contractors, and

*Engineer, Industrial Power Section, Industrial Engineering Dept., General Electric Co., Schenectady, N. Y.



Indoor unit-substation in industrial plant, all connected and awaiting completion of floors and installation of machine tools.



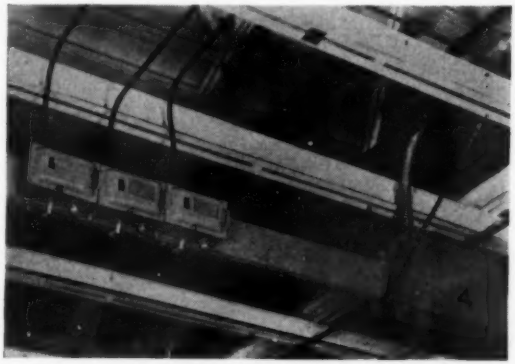
Installation crew moving 750-kva indoor load-center unit-substation into position in large eastern war plant. This illustrates how easily such equipment is installed.

others charged with the responsibility of designing and erecting our war plants.

Called load-center power distribution, this system has been applied widely in war plants, shipyards, arsenals, as well as in expansions to existing facilities. The new method employs high voltage to transmit power into the building to the center of the load area. If the loads are heavy enough, several small load-center unit-substations are used at individual load centers.

This system compares with the old idea in which low-voltage power was supplied through a large substation outside of the factory; the high voltage was then transformed to low voltage and distributed direct to utilization devices through long low-voltage feeders. The low-voltage feeders required a great amount of copper and power losses were high. In addition, much more installation time was needed.

It is interesting to note that in the past year and a half, the popularity of the load-center power distribution system has been such that an estimated 2000 load-center unit substations have been applied in war plants. This is especially significant when we consider that the average size plant uses about



Ordnance plant installation showing installation of recently developed power run. To the right of the boxes are outlets for plugging in power utilization devices.

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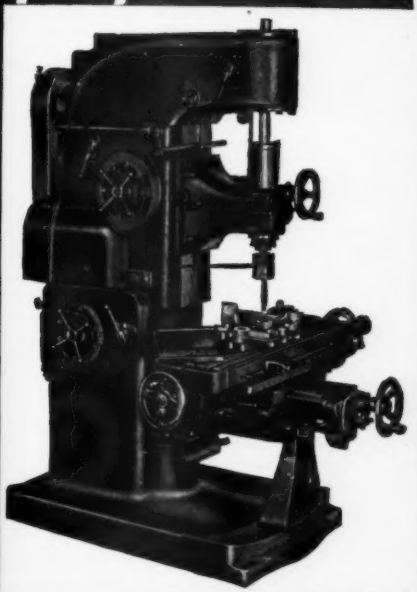
Today time is vitally important in winning the war. Every minute saved in production is a punch at the axis.

The No. 40 Knight Miller by performing these 5 operations at one setting, saves precious hours of down-time on many jobs. In addition, the special swivel and tilting table features save the use of many angle plates and cutters, and special fixtures. Still more time is saved.

The No. 40 Knight Miller has a wide range of capacity, fitting it for many jobs and uses. There are 16 different spindle speeds ranging from 40 to 1400 r.p.m., with reverse provided. 16 table speeds range from 1/2" — 12 3/4".

Write for further details.



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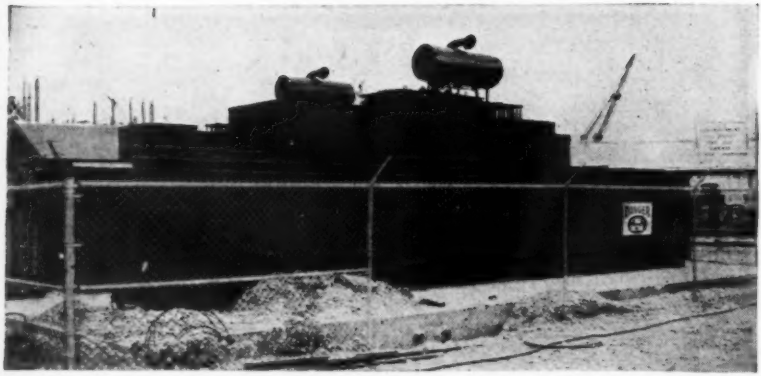

Two master unit-substations installed in large shipyard. These substations feed load-center distribution system in this yard.

six unit substations. The substations installed ranged in size from 100 to 2000 kva. most of them being from 300 to 500 kva for 220-or 120/208-volt secondaries, and from 500 to 1000 kva for 480-volt secondaries.

The use of load-center power distribution systems and factory-assembled unit-substations has permitted very significant savings in materials, and in many cases, has saved war plants considerable time in getting into operation. From the viewpoint of time and material savings, it might be of interest to cite the experience of a few recent war plant installations. These are actual cases drawn from our experience.

First, let's take an example of where equipment was ordered part by part for a midwestern ordnance plant. Four month's time elapsed between the drawing of the electrical circuit diagram and ordering of the equipment. This time was consumed in making detail drawings of field-assembled equipment, writing specifications for each component part, and checking to see that three bids could be received on each part and that all miscellaneous items such as hardware, conduit, etc., were properly specified. The equipment was shipped in 10 to 12 weeks and installation time took two months more. Thus, the total elapsed time was about nine months.

Compared with this, all of the load-

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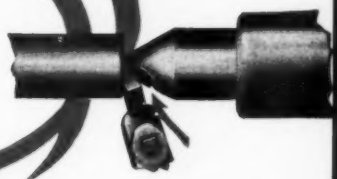
I'm tellin' you.

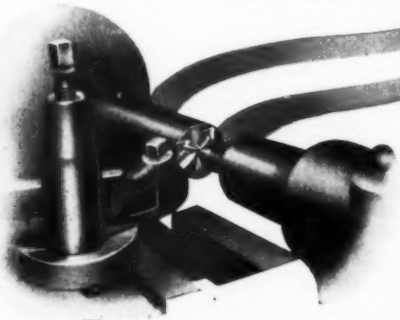
No. 8 in a Series of Tips on "Keeping 'em Turning" by Frank Morris, 42 yrs. at LeBlond

FACING TO LENGTH

Since facing is one of the most common lathe operations, most lathe hands figure they know all there is to know about it. It's not particularly difficult, but I've seen some good men go wrong on these points.

1. You'll save lots of time and effort if you'll keep handy an extra tailstock center that has been grooved or flat ground on the taper. This makes special tools unnecessary because it leaves room for a standard shape tool between work and center. Caution: Be sure flat surface is less than half way through point or it will act as a reamer.





2. For the finishing skim cut, *work from the inside out.* In other words, you start with tool point at the center hole and cut toward outside diameter of the piece with tool edge at slight angle with end of work.

3. Should chatter marks appear on the work, it is because work is running too fast, feed is too great, or angle of tool is too slight. All of these are easily corrected.

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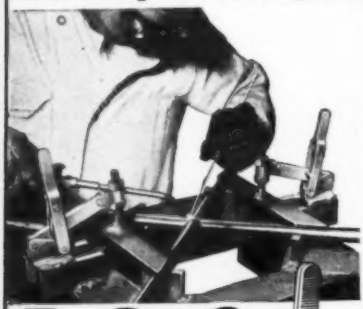

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A complete line, all sizes, each clamp carefully engineered for quick, positive action and long useful life. Thousands of De-Sta-Co Toggle Clamps now used to speed up work in National Defense plants.

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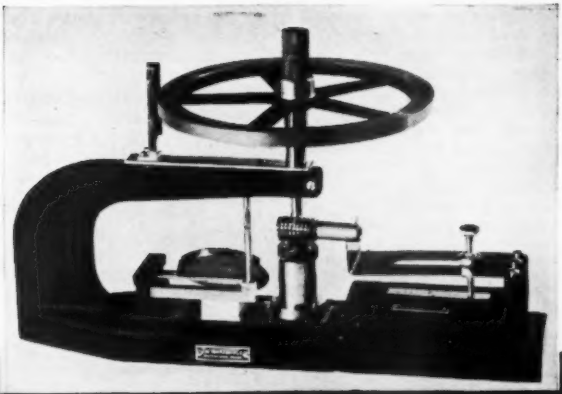
center unit-substations for an eastern shipyard of about the same size as this plant were on order two months after the original circuit diagram of the system was completed. This time saving was made possible by elimination of detailed specifications for each part; general functional specifications for standard substations were all that was required. The substations were shipped in 16 weeks and installed in four weks. The total elapsed time was seven rather than nine months.

In an eastern manufacturing plant, where load-center distribution and unit-substations were employed, the substations were ordered as soon as dimensions of the building were known. The load was estimated on the basis of loads in comparable buildings and the total demand determined. The economical size of unit-substations had been well established and it was a simple matter of division from then on to determine the number of substations involved. Manufacture of the units was under way while the design and construction of the building progressed. It was not necessary to wait until the building and production processes were well along before the electric equipment was ordered. In this particular installation, the load-center unit-substations were ready and waiting by the time the building had reached the point where they could be used.

In one manufacturing plant in the central eastern section, an old-type distribution system was used. The system required some 35 tons of copper, whereas if load-center distribution had been used only 15 tons would have been required.

In other installations, load-center distribution has shown equally astonishing figures. For example, a small manufacturing plant in New England as originally laid out with an old-type distribution system would have required 10 tons of copper. Change to a load-center distribution system brought this down to only six tons of copper—a saving of 40 per cent.

This performance in saving time by using load-center distribution and factory-assembled unit-substations,



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  A calibration chart showing the micrometer screw corrections to .00001" is furnished with each instrument. The new type of hardened and ground precision micrometer screw actually improves with use. Fine workmanship and carboloy wearing surfaces make the instrument accurate and dependable for years of constant service.

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23RD YEAR

SYSTEM

and saving material by using load-center distribution systems with small transformers at load centers has been repeated in hundreds of cases.

Although money expenditure is of less importance in furthering the war program, it does to some extent represent man-hours, and viewed from that standpoint deserves full consideration. The elimination of the long, low-voltage feeders required for the older distribution system and the use of small size substations rather than the large ones resulted in savings of from 25 to 50 per cent of the cost of the distribution system, in most of the installations employing the load-center principle.

MASTER-UNIT-SUBSTATIONS

Although master unit-substations have been used for a number of years by utilities, it is only recently that they have seen use in industrial plants. These have been applied mainly at plants supplied by voltages above 15 kv, where the master unit-substation transforms the power to a lower voltage so that it may be transmitted to the load-center units within the plant itself. These substations fit admirably into the war program since they use three-phase transformers and a switchgear structure that is most economical of copper.

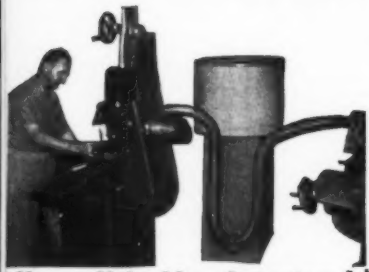
FLEXIBLE LOW-VOLTAGE DISTRIBUTION SYSTEMS

The distribution of low-voltage power —600 volts and less—has been materially improved by a recently developed power run which provides rows of power outlets for literally plugging in machine tools and other power using devices. This is a definite contribution since it greatly simplifies the moving of equipment to afford better production schedules. Formerly, such changes required moving panelboards and other connections.

COMBINED LIGHT AND POWER

In the past, it has been almost universally common practice to use separate light and power circuits in industrial plants; lighting circuits were usually operated at 120/240 volts and power circuits at 480 volts.

With the development of modern high-level illumination—especially that utilizing fluorescent lamps which are admirably suited to higher voltages—the general area lighting in many large plants is now placed directly on the 480-volt power circuits. This has reduced the quantity of copper that would have been required for the low voltage distribution system by about one-third, and has resulted in lowered cost since 480-volt distribution systems are less expensive than 120/240-volt systems.



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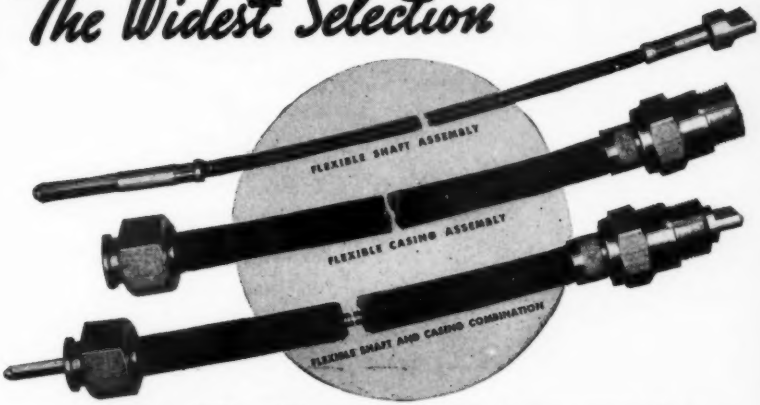

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CONSULT S. S. WHITE when you need flexible shafts or want engineering aid in working out a power drive or remote control problem. At present, our products and services must necessarily be confined to work associated with the war effort.

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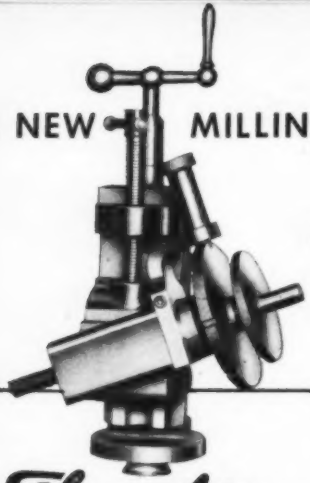

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x Fixture tilted at 30° mill- end teeth in Taper Reamer.

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of Fixture on 30° angle g and teeth in cutter.

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THOMPSON TOOL DIVISION

342 WEST PUTNUM AVENUE

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WILLARD— THE TOOL HOLDER WITH A SPRING

The spring feature of a Willard Tool Holder prevents shock to the cutter — minimizes cutter breakage — makes possible faster feed with a heavier cut — and it's accurate at all times. Damaged work is reduced to a minimum because the spring eliminates chatter — can be used for all types of threading, coarse or fine — adaptable to a wide variety of work. Economical, efficient and ACCURATE. Specify "WILLARD" the tool holder with a SPRING.

Threading and Forming Tool Holder — right hand offset — furnished with hardened wrench and one high speed cutter — made in 3 sizes for ¼" — 5/16" and ⅜" square bits.

Threading Tool Holder—straight or right hand offset — furnished with hardened wrench and one single cutter point — threads close to a shoulder — produces smooth, accurate threads.

The Willard Spring Tool Holder is made in a variety of sizes — for threading, cutting off and forming. Especially adaptable for use in automotive, aircraft and precision repetitive production work.

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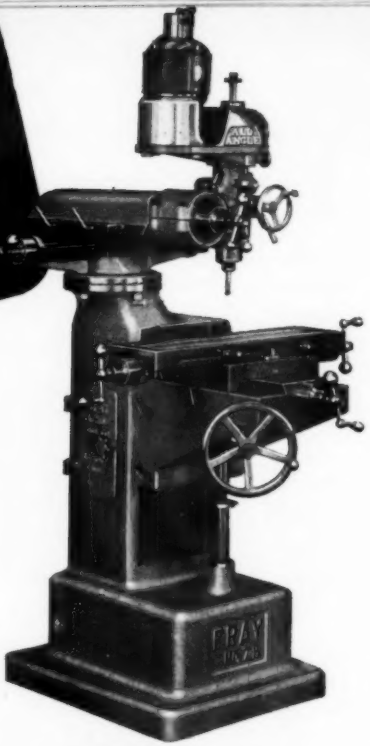
FRAY
PRECISION TOOLS
Serving
The
Production Fronts



RAM TYPE No. 7-B
Vertical Universal Milling Machine

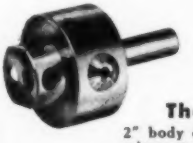
Without changing the work set-up, machining operations can be done at any angle in either or both the vertical and horizontal planes. All movements of the head are accurately controlled with calibrated dials. The maximum of flexibility desired by tool makers is a feature of the Fray No. 7-B Machine.

MICROMETER OFFSET BORING HEADS

Hundreds of firms now have Fray Boring Heads in their tool cribs for FAST, PRECISION WORK. Time is saved and guess work eliminated with the calibrated off-set adjustment dial. Three tool holes provide wide flexibility of service, with only two boring bars. Exclusive design maintains accuracy.

The STANDARD

3" body diameter... ½" of micrometer offset adjustment... dial set flush with 50 graduations of .001" each... shank tapered and tapped for draw-in bolt... No. 7 Brown & Sharpe or No. 2 Morse taper arbors standard (special arbors furnished on request)... two ½" boring bars furnished with Head.



The JUNIOR

2" body diameter... 5/16" of micrometer offset adjustment... dial calibrated in .001"... straight shank... two ⅜" boring bars furnished with Head.

Users of FRAY Milling Machines and All-Angle Milling Attachments are ASSURED of a dependable source of End Mills, through the Fray Tool & Reamer Co. All standard types and sizes.

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Manufacturers of: *All-Angle Milling Attachments, Milling Machines, Offset Boring Heads and Boring Bars.*

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The Foremanship Forum

By EDMUND MOTTERSHEAD

Part VIII. Breaking the Supervision Bottleneck

AS American industry gets under way in the second year of our participation in the war, we can look back at months of great achievement. Plant conversion to war production has been solved to a great extent. Shortage of skilled labor is being met by training programs of one kind or another. While the labor shortage will become increasingly difficult as a problem, employers are now being faced with the problem of selecting and developing new foremen and supervisors.

Our ability to utilize all available labor resources to the utmost depends largely upon caliber of our industrial non-coms—the supervisors, foremen and leadmen.

In meeting the skilled labor shortage, skill itself has been broken down and analyzed for training purposes. We find essentially three types of skill:—muscular, sensory, and thinking. We have found ways to train muscles, coordinate senses in action, make ideas and understanding grow in the mind of the worker. From these we have developed ways and means of upgrading workers, so they soon are working at maximum skill in the type of work for which they are best suited.

The objective of such skill analysis has been to isolate and identify muscular, sensory and mental phases of a job and so to relate them in a progressive pattern of learning and training that learners proceed from the known to the unknown and from the simple to the increasingly difficult and complex.

Let's apply this reasoning to obtaining capable foremen and supervisors. In place of muscular, sensory, and thinking skill as such, the foreman's job requires technical, executive, and dynamic skills, shown in Figure 1.

Technical skill is essentially the foreman's knowledge of the jobs in his department. Preferably. he should have

For many months, Ed Thomas of the Assembly Dept., The Warner & Swasey Co., Cleveland, had been tapping the holes in hexagon turrets as a hand operation.

In the days when 75 turret lathes was the production goal for a whole month, tapping those holes was necessarily a hand operation. However, with several hundred lathes as the present production pace, it occurred to Thomas that a machine could do the job equally well — and a lot faster. He made that suggestion and is shown here receiving a Thousand Dollar War Bond and congratulations from Charles J. Stilwell, Warner & Swasey president.

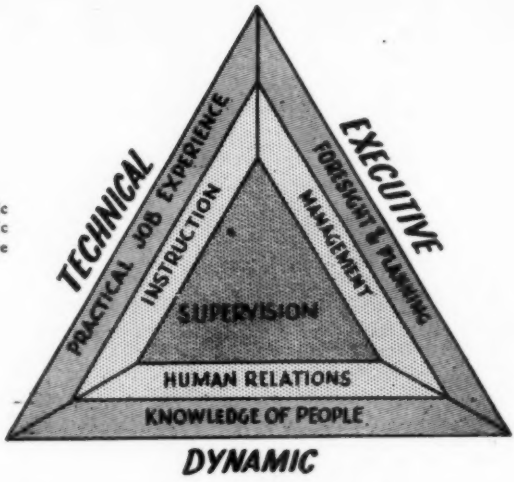

Fig. 1, showing a graphic representation of the dynamic skills, comprising the three phases of Supervision.

performed all the jobs which he is to supervise. More often, the foreman has not performed all, but most of the jobs. Occasionally, we find a foreman or supervisor who actually has technical knowledge of only one of the jobs, or maybe none of the jobs. He has been made foreman because of other abilities.

He should be better informed than his workers on any of the jobs. He should be able to show them practical short-cuts for efficient work. His ability as an instructor is an important part of his technical equipment. He should know enough about the work to tell when workers are not turning out a fair day's work. In connection with this, he should have some knowledge of rate setting, wage scales, and, if possible, time study.

As an executive, or manager, he deals with the working force as a production unit. He is concerned with safety, health, and working conditions. He is responsible for the tools and mechanical equipment in his department to the extent that proper tools and equipment are provided, and receive proper care and use. Power equipment in his department requires his attention, as to care and use. Materials and supplies must be received, stored, routed and inspected. He has control of operations and processes, plans production and changes operations where necessary. He is burdened, also, with a certain amount of paper work. It includes necessary records, plans. directions, suggestions, reports and ordering. Costs are his constant problem, especially the indirect or hidden costs. Plant policy is another element in his job.

On the dynamic side, the foreman has a constant problem in dealing with people. Far too many foremen have technical and executive skill but relegate problems of human relationships to the backs of their minds. Or worse, they shove them onto the shoulders of the personnel or industrial relations department. The foreman must develop and maintain morale and discipline in his department. He must obtain cooperation, not only from his workers, but from other foremen and from his superiors as well. Friendliness, loyalty, fairness, appreciation, control of his own temper, open-mindedness, and many other qualities of leadership are prime requisites in successfully handling the job.

So far, we have briefly outlined the

Use This Steel and SAVE

WITH Martin Master Collets, the replacement of three small pads gives you the equivalent of a brand new collet. The steel required for these pads is only a fraction of that required for a complete collet . . . representing a definite saving in the vital alloy steels needed for collet manufacture.

Of equal importance is their time-saving feature. The interchangeable pads are removed from the end of the collet while the collet itself remains in operating position in the machine. A complete change of collet size can be made in from five to seven minutes . . . making possible a substantial increase in the number of hours of a machine's productive time.

The pads used in Martin Master Collets are integral parts of the locking wedges which fit tightly into the end of the collet. They will positively not become loose. When it is necessary to change the pads, a few turns of the wedge screws permit quick removal.

Under present conditions, the many advantages of these collets . . . particularly for machines with capacity of 1½" and over . . . should be given real consideration. Write for full details.

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MODERN COLLET and MACHINE CO.

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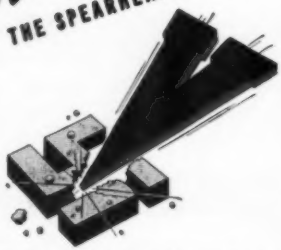
Metal Shapes-

THE SPEARHEAD OF VICTORY



Slowly the Axis crumbles under the blows of America's war implements which RITCO is proud to help build.

For over a century, we have been working in metals, solving the special problems of customers in many industries. Let our long experience and complete equipment help you in your production problems.

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SPECIAL BOLTS, NUTS AND STUDS
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three essential types of skill required for the task of foreman or supervisor:—technical, executive, and dynamic. The purpose of this analysis has been to break down the job itself, so we can see the problem, in meeting shortage of good supervisory employees.

There are four main ways in which top management can meet the need for supervisory employees:— 1. Selection 2.-Training 3-Motivation. 4-Supervision.

Selection

Attainment of skill as a supervisor depends upon two important factors:—heredity and training. Heredity may put certain limitations on the individual which no amount of training can overcome. However, many men who lack in technical or executive ability, due to previous experience, may have a particularly well developed dynamic side. The first thing management should do in building up the supervisory staff is inventory the aptitudes of the men they have in mind for such jobs,

Distinction between two types of tests must be made, however, there are aptitude tests which discover, and in some sense measure, native capacity. There are proficiency tests which measure the degree of skill an individual may possess along certain lines. Both types of tests are necessary.

The Army, in selecting men for the Officer candidate schools, uses a battery of tests. One, the General Classification Test, commonly referred to as the "I.Q." test, is used to discover and measure capacity and innate ability. Other instruments for measuring individual differences have been created and put to use. They include literacy, clerical aptitude, mechanical aptitude, and various trade tests. Trade tests are oral and written—where specific questions about the trade are asked. There are picture tests in which the candidate is asked to identify tools and equipment used in the trade and describe their use. In performance tests the candidate is required to do the actual work in the trade. Special tests for many occupations are also given.

Dr. Walter Van Dyke Bingham, chairman of the committee of psychologists

Reclaim Your High Speed Steel Cutters

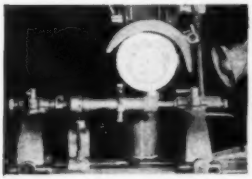
By Brazing-on STANDARD CARBIDE BLANKS

When your high speed steel cutters are "worn out", don't scrap them. They usually can be reclaimed by simply torch-brazing standard carbide tips to the cutting edges of your cutters.

Standard styles of carbide tips are readily available to meet practically all carbide tipping requirements for all commonly used types of high speed steel cutters. With a small master stock of standard tips in your crib, you'll be prepared to reclaim and re-tool fast.

Complete instructions on request.

THREE EASY STEPS AND YOUR OLD CUTTERS ARE RENEWED



1 First grind a recess in the faces to which the carbide tips are to be brazed. Plan recess so that tips will project slightly over edge—for grinding back to size. Bottom of recess should be ground flat surface but not necessarily smooth.

2 Using an oxy-acetylene torch, flux, and silver solder, braze standard carbide tips in place. Process is essentially the same as regular braze for carbide tools—except braze should be completed fast to prevent oxidization and loss of chrome.

3 Grind carbide tipped "high speed steel" cutter in same way you regularly grind any carbide tipped cutter. Cutter is now ready for many times life of the original. When again worn, you can often resize using same process.

CARBOLOY COMPANY, INC.

Sole makers of the Carboloy brand of cemented carbides

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TRADEMARK

TOOLS • DIES • DRESSERS • MASONRY DRILLS • WEAR RESISTANT PARTS

These veteran General Electric machinists, all boasting more than 25 years of Company service, are shown receiving gifts presented spontaneously by younger workers in appreciation for teaching them to do an all around better job of producing for victory. Left to right, the Schenectady Works "old timers"—Charles Johnson, Albert Smith, Sid Bishop, John Wooten, Thomas Burns, and Charles Tries—receive pipes, tobacco, and other presents from Darwin Kelly, representing the younger men. That's the friendly, cooperative spirit that should be encouraged in every shop.

that developed the tests believes they will indicate ability to be a soldier with something like the accuracy of an orange sorter, separating the big ones from the little ones. There will, of course, be occasional errors.

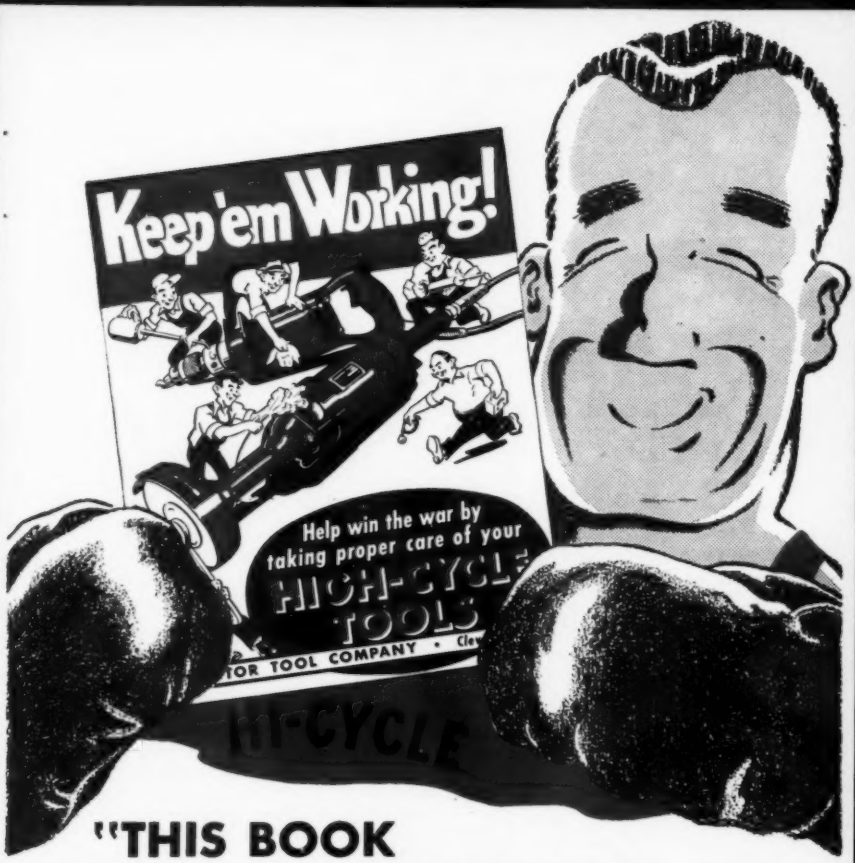
The point for top management to remember is that one agency, the Army, has probably the world's biggest single task of selecting leaders. Requirements for such leadership are the same—technical, executive, and dynamic. The Army not only has faith in such methods of testing for selection, but practical results have proved that the method works. The tests are neither tricky nor esoteric. They are practical and provide a method of selection which is within reach of industrial employers in selecting their supervisors.

Training:

The first step for top management, in carrying out a program of foreman or supervisor training, is to analyze the work these men are to perform. How can the foreman's job best be analyzed?

The object of such analysis is to itemize the technical, executive, and dynamic aspects of the job. A trained industrial psychologist might make a direct, simultaneous approach along these three lines. For most business men, however, this might prove difficult. But, top management has at hand a ready source of the information—the present supervisory staff.

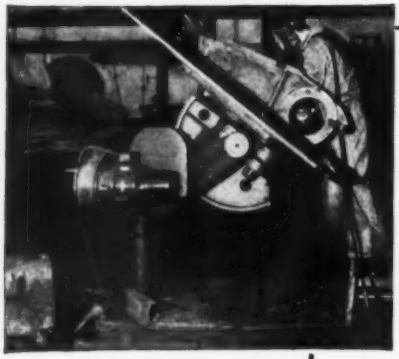
It would be, for example, relatively simple to have every foreman, leadman, supervisor, put in writing a detailed description of his own work. A large insurance company, employing nearly 3,000 men and women at the home office, requested every employee to keep a rough diary of daily activities for a week. From more than 3,000 diaries information was tabulated and analyzed into a complete job-description of every activity in the office. Thus the firm arrived at a very clear understanding of the nature of each job. It conse-



"THIS BOOK *Tells How to Par-Boil Hirohito"* —HI-CYCLE O'TOOL

WHEN you keep your portable tools up to *par,* you make Hirohito *boil.* This Rotor Maintenance Manual gives 12 recipes for taking proper care of your HIGH-CYCLE tools to keep them putting the heat on the Axis. This book and a handy wall chart are available to plants with good appetites for Victory. Send for your copies today.

THE ROTOR TOOL CO.
CLEVELAND, OHIO



C-F POSITIONERS

Speed Production and Job Welding

C-F Positioners make welding a faster and more economical operation — save time, save man-hours. The welder himself turns and tilts and positions even the clumsiest and heaviest weldments with a push button control — without cranes, crane crews, hoist, jacks or "flopping" space. All sides can be welded down-hand — all welds can be made faster with heavier rods; made stronger, smoother and flawless.

C-F Positioners come in sizes and types for every welding need — range from small hand operated units for light job work to giant positioners that swing great weldments weighing 30,000 lbs. All have platforms that rotate the full 360° and tilt to 135° beyond horizontal. *All are adjustable for height and are pedestal mounted to give greatest floor clearance.*

Write for Bulletin WP 22.

CULLEN-FRIESTEDT CO.,
1331 S. KILBOURN AVE. CHICAGO, ILLINOIS

quently had some basis of definite knowledge of the type of worker and skill required for each.

Another way to arrive at the same result is to have each supervisor write an outline of his duties and daily activities, as he sees his job as a whole, without reference to any daily or weekly pattern of activity.

As a check against information received through this method, there are plenty of good foreman-training organizations which can provide top management with a check list of functions or a check-outline of the foreman's job. A good description should take into account these factors:

1-Statement of duties performed.
2-Mental requirements of the job.
3-Skill requirements.
4-Physical requirements.
5-Responsibilities.
6-Working conditions.

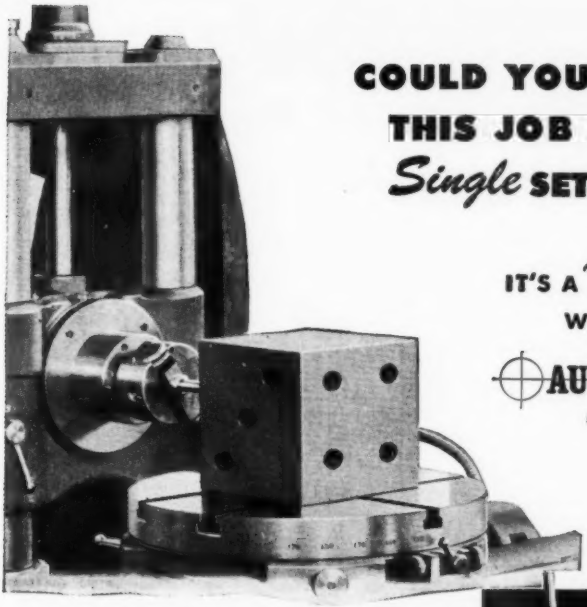
A good job description in breaking down the work of foremen and supervisors should take into account all three basic factors in the supervisor's job:—1-Technical. 2-Executive. 3-Dynamic.

From the job description, it should be a simple matter to set up a card form, say, 8½x11", to serve as the job qualification card. The personnel man should have a master card with the required qualifications indicated, with a supply of blanks to be filled out to fit individual supervisors. The job qualification card should cover the three factors in the job:—Technical, Executive, and Dynamic.

From the technical standpoint, there should be space to indicate the machine and skill knowledge and experience of the man, his training and general technical competence, knowledge of specific machines and operations, set-ups, etc.

From the executive standpoint, the particular responsibilities of his supervisory job should be considered, with spaces to indicate both determinable abilities and experience in handling such responsibilities.

From the dynamic side, spaces should be provided to indicate the impressions and judgment of the interviewer and



COULD YOU BORE THIS JOB IN A *Single* SET-UP?

IT'S A *"Natural"* WITH THE

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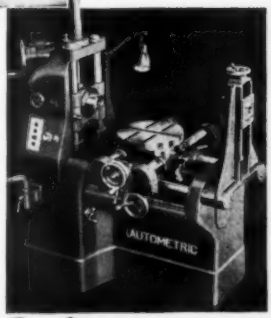
MODEL B

The illustration shows a typical time-saving operation on the Autometric Model B. All of the holes in all four sides or at various angles in a box jig or production part are produced with one clamping of the work piece.

Its ability to handle a complete job in a single set-up—more rapidly and accurately than ever before — makes the Autometric Model B indispensable equipment for the precision boring of a wide variety of parts.



Model B Autometric Features:

- Errorless measuring—more rapidly, more accurately — by the Autometric method.
- Infinite variation of spindle speeds by finger tip control.
- Infinite selection of feeds by finger tip control.
- Hardened — ground — and super-finished steel ways.

Write for complete information on the Model B Autometric Jig-Boring Machine.

Buy Victory...

WITH AT LEAST 10% IN WAR BONDS

Rotary Head Milling Machine

Autometric Jig Borers

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PROVIDENCE PLANT
PERSONAL RATING FORM
QUALIFICATIONS FOR FOREMAN, FORELADY, SUPERVISOR

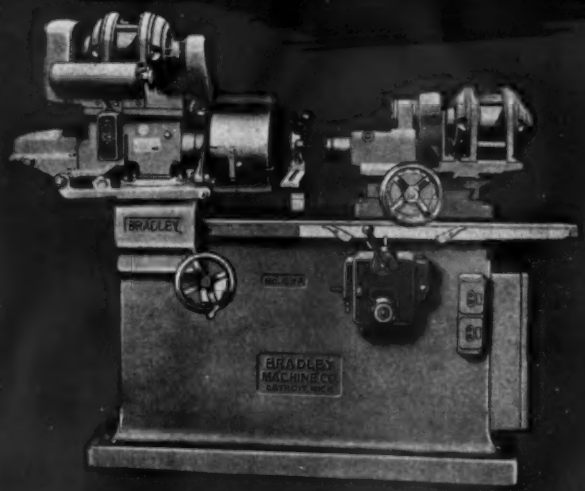
QUALITIES						POINTS
Leadership, Initiative	Avoids responsibility, little or no ambition, poor supervision of others. 0	Can supervise others when told what to do and how. Carries out instructions. 10	Accepts responsibility, uses his head, shows some initiative. 25	Accepts responsibility, good executive ability, has initiative. Well liked, efficient. 40	Assumes responsibility, uses authority properly, good leader, firm, impartial. 50	
Temperament, Attitude, Personality, Health	Grouchy, pessimistic, unsure of self. 0		Quiet, self-contained, pleasant, loyal. 5		Alert, cheerful, loyal, popular, vigorous 10	
Supervisory, Experience	1 or 2 helpers 5		2 - 10 people 10		More than 10 people 15	
Education and Practical Knowledge	Grade School 0	High School but no technical education. 5	Trade, Shop or Correspondence Courses. Knows his job and department. 10	General College or self-educated. Knows his job and department. 10	Technical, Engineering, etc. "Knows the answers" to factory problems. 15	
Paper Work and Reports and Filing	Careless, Incomplete Untidy. 0		Good, Complete 5		Complete, Accurate, Prompt, Legible. 10	

INSTRUCTIONS: Please read entire form before making any rating. Do not ask any other person's opinions. You may consult person for facts as to education or experience. Circle the figure in the column that most accurately describes the person's characteristics. Enter that figure in last column headed "Points", and add up total. Three independent rating sheets should be made on each person and all three should be considered in making final rating.

Total-

THE BRADLEY · · ·

HYDRAULIC INTERNAL GRINDER



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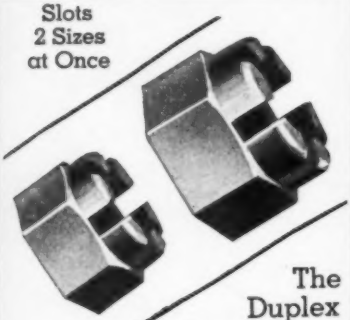

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NUT SLOTTER

Makes Possible a New High
in Production Speed

- 2 CONVEYORS RUNNING CONTINUOUSLY, TOGETHER OR INDEPENDENTLY.
- 6 CUTTERS MILLING CONSTANTLY . . . . .
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- AUTOMATIC BURR REMOVAL . . . .
- AS HIGH AS 3000 SLOTTED NUTS PER HOUR . . . ALL SIZES FROM 3/8 TO 15/16 HEXAGON ACROSS FLATS

Larger Machines Available

Speedy Set-up Change

PELLOW MACHINE CO.
13502 FOLEY AVE. DETROIT, MICH.

the man's experience in handling people —types and kinds of workers he has handled, numbers, time, etc.

Now that you have the job description and the job qualification card or form, you know pretty well the type of man required. Where will you find him? Possibly from the ranks of the applicants in the employment office or through newspaper advertisements—probably not. More likely, he is already at work in your plant in some lesser capacity, possibly a leadman or an older worker. Your third step in breaking a supervisory bottleneck should be a plant inventory of personnel.

Fifteen years ago, Joe Smith came to work as a general machinist. He was put on a bench lathe. He has stayed on a bench lathe those 15 years, always doing fine work, always getting along well with his fellow workers, occasionally making valuable suggestions, but still on a lathe. His application stated that he was a trained machinist. He served his time as an apprentice in a well known railroad shop and graduated with a wide range of skills. In the early 20's he had trouble with his health. When he got well he had to look for another job, ending up on the bench lathe in your shop. The depression kept him there. In the years that passed, his broad background was more or less forgotten. He was looked upon as a good man on his machine. His suggestions and ideas were practical, but were lost in departmental operations, no one pausing to wonder specifically from where they came.

Joe Smith could be a foreman. He could be a supervisor. He has the technical background, the knowledge of executive work. In the years that he has been with your organization, he has observed many things, and is in a good position to plan and manage. The men like him and would probably work well for him. How long will he stay where he is?

Every company of any size at all has buried talent, half-lost skills, men who are capable of greater responsibility, more difficult tasks. In the ranks of your own personnel you undoubtedly have the man power and womanpower

Official U. S. Army Photo

Here's What It Takes To Build Your Glory Road

When a Colonel of engineers said the new Alcan Highway —the "Glory Road of America"—was built by "guts and tractors" he stressed the former.

ALTER EGO: And how right he was! When tough "competition" from the west threatened to annihilate us, it jolted us into super-action. Alcan's 1800-mile route through uncharted wilderness—said to be *impassable*—was a confusion of mud, mountains and mosquitos. Under the spur of Jap "competition," we finished this "glory road" in one season.

Maybe that's a lesson for us to be on the alert for the tough competition that'll invade all business after the war. Let's jolt ourselves into super-action now.

ALTER EGO: Right! We've got to hack through plenty of uncharted wilderness that seems impassable . . . with little time on our hands . . . and come out with *better products* and *lower costs* than the other fellow. *Will-power* and *ingenuity* will build *this* "glory road."

We have the will-power. Let's acquire the ingenuity by improving our welding knowledge *with Lincoln's aid.*

Ask your inner self if welding knowledge isn't the shortcut to postwar success.

THE LINCOLN ELECTRIC COMPANY . Cleveland, Ohio

KEYSEAT CUTTERS
IMMEDIATE DELIVERY

HIGH SPEED—RIGHT HAND—½" SHANK

Number	Diameter	Thickness	Price Each High Sp.	Number	Diameter	Thickness	Price Each High Sp.
201	1/4	1/16	2.45	14	1	7/32	2.66
206	5/16	1/16	2.45	152	1	3/32	2.94
207	5/16	3/32	2.45	16	1 1/8	3/16	2.94
211	3/8	1/16	2.45	A	7/8	1/4	2.38
212	3/8	3/32	2.45	15	1	1/4	2.66
213	3/8	1/8	2.45	17	1 1/8	7/32	2.94
1	1/2	1/16	1.96	18	1 1/8	1/4	2.94
2	1/2	3/32	1.96	19	1 1/4	3/16	3.22
4	1/2	3/32	1.96	20	1 1/4	7/32	3.22
3	1/2	1/8	1.96	21	1 1/4	1/4	3.22
5	5/8	1/8	1.96	22	1 3/8	1/4	3.50
7	5/8	1/8	2.17	24	1 1/2	1/4	3.85
6	5/8	5/32	1.96	B	1	5/16	2.80
61	5/8	3/16	1.96	C	1 1/8	5/16	3.08
8	3/4	5/32	2.17	D	1 1/4	5/16	3.43
91	3/4	1/4	2.17	23	1 3/8	5/16	3.78
10	7/8	5/32	2.38	25	1 1/2	5/16	4.13
9	3/4	3/16	2.17	E	1 1/4	3/8	3.43
11	7/8	3/16	2.38	F	1 3/8	3/8	3.78
12	7/8	7/32	2.38	G	1 1/2	3/8	4.13
13	1	3/16	2.66				

EASTERN TOOL SUPPLY CO.

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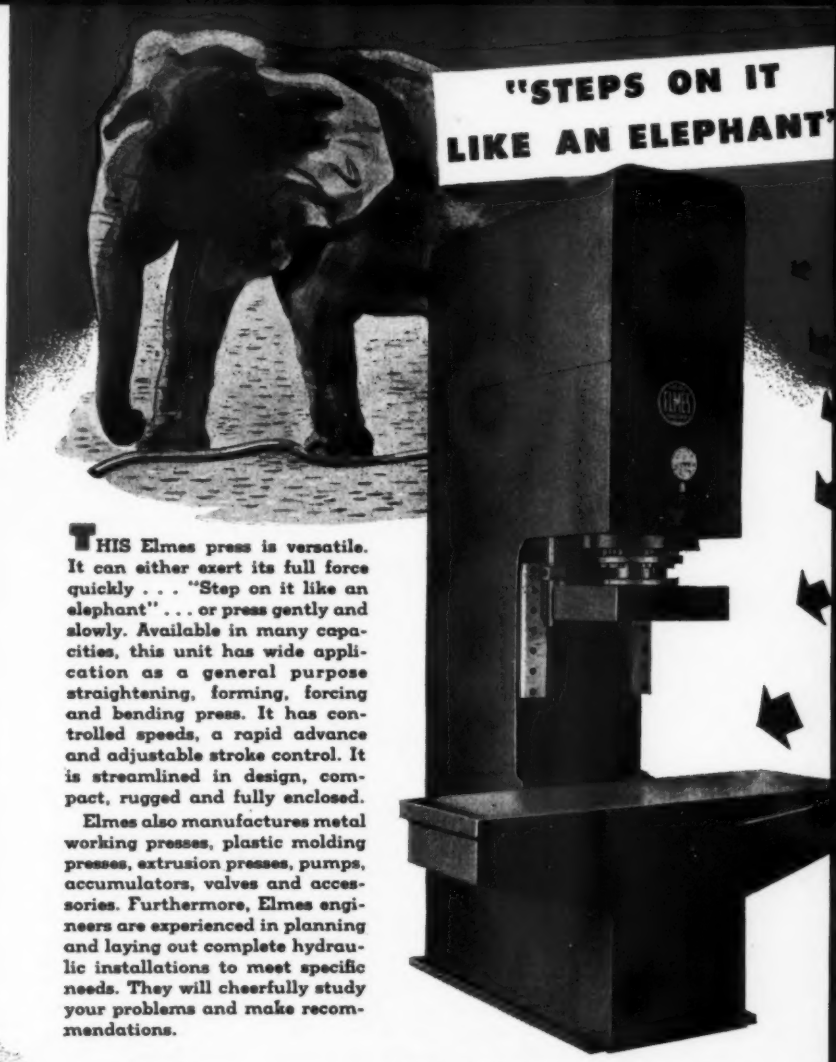
to provide competent supervisors and foremen. Dig them out with a personnel inventory.

Such an inventory can be handled by personal interviews with every employee, or by questionnaire or by both. A good method to follow is to use a questionnaire based upon the job qualification card. Analyze the data and enter the required information on the job qualification card. Follow this with interviewing likely candidates. Check this with a system of supervisor or foremen reports on the candidates.

The Industrial Relations Department of the U.S. Rubber Co., Providence, R.I., for example, is working out such a method of foreman reports on the qualifications of supervisor candidates. A copy of a tentative personal rating form to be used in their plan is shown. Numerical weighting of the various qualifications, of course, is largely a matter of your own opinion in determining the relative importance of certain qualifications. Perhaps it would be better to have three such forms, one each on the technical, executive, and dynamic phases of the candidates' abilities, rather than to assign numerical values to the three general divisions of his qualifications. Within the three divisions, you can weight the specific qualities to suit yourself.

Whatever type or method of personnel inventory you use in digging out supervisory personnel, the inventory should go hand in hand with recommendations from existing department heads and foremen. Use of suitable aptitude and skill tests is also an integral part of selecting supervisor-candidates, either from the ranks of your present personnel or from outside applicants.

The men and women selected for training should be as carefully informed of the conditions of the program as are men today who apply for officer candidate training in the army. In other words, if top management decides to choose men and women for



THIS Elmes press is versatile. It can either exert its full force quickly . . . "Step on it like an elephant" . . . or press gently and slowly. Available in many capacities, this unit has wide application as a general purpose straightening, forming, forcing and bending press. It has controlled speeds, a rapid advance and adjustable stroke control. It is streamlined in design, compact, rugged and fully enclosed.

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Awarded the N M B T A "Oscar" for greatest 1942 increase in 4th quarter over 3rd quarter shipments of machine tools, Sheffield Corp., Dayton O., officials, Milton Ahlers (left), Mgr. Machine Tool Div., and Ray Mahlmeister, Supt., Machine Shop, read telegram notifying firm of the award. Sheffield topped all other member firms with an increase of 224%; at a time, too, when new production records were being hung up regularly, making precision measuring instruments and gages. In September, it was awarded its Army - Navy "E."

supervisory positions first, and then train them—or if top management decides to select possible candidates, train the whole group, and from the group select those who will eventually become the supervisors and foremen—the men and women should know exactly what goes on. One firm selected a group of 48 men and women from which they planned to select some 24 working foremen. These people were put through a training program and a probationary period of work. After a determined number of weeks, the choice was made. But all knew that such would be the procedure.

It eliminates possibility of misunderstandings and injured sensibilities. It also creates a certain competitive spirit among the trainees so there is greater effort to learn and do good work and obtain the advancement.

Trainees should be considered as a segregated group. The Personnel Research Federation in a survey entitled "Skilled Workers for Defense Industries", reports findings with a group of segregated and carefully instructed workers in one company, to see if the learning period could be shortened. At the end of the 11 weeks output of these workers was equal to that of workers trained under regular shop conditions for 26 weeks. Their productivity continued to increase to almost double that of casually trained new workers, and was appreciably higher than the average of experienced older workers. The same applies to training of supervisors and foremen with particular regard to the executive and dynamic phases of their tasks.

An all-around supervisor training program should include these essential elements:

1—Gradual implanting of necessary information. "Small doses", with sufficient time for assimilation are essential to easy learning. To follow out the gradual implanting of small doses, a program of three meetings a week might be developed, one devoted to technical, one to executive, and one to dynamic problems of the supervisor's job.

2—Practice in perception and awareness of factors in the job in hand. The plan, used by many companies, of having trainees serve as working lead men or working foremen for a time—or the practice, used by other companies, of having the trainees serve as assistant supervisors, instructors, etc.—gives opportunity for them to develop awareness to the technical details of the jobs they will have to supervise. It gives them a chance to think as executives along lines which appear in the department. It gives them many opportunities

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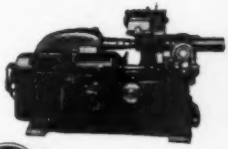
WHEN your desk is snowed under with problems, production plans and blueprints, pull up a chair for Bryant. For every phase of a new job that relates to internal grinding is a phase that interests Bryant . . . every angle and opportunity whereby time, money, stock or operations can be saved on these phases is a chance for Bryant to help you.



Today, Bryant engineering service—vastly stepped up to meet the urgent needs of armament—is more than ever geared to meet the equally vital problem of planning new products that can be made economically and sold at a profit when peace returns!

This is an added reason for the forward-looking executive to "pull up a chair for Bryant."

BRYANT CHUCKING GRINDER CO.

Springfield, Vermont, U. S. A.

to analyze and appreciate the dynamic aspects of their future task.

3—Performance and repetition in their daily job give trainees occasion to make habitual, the necessary reactions to situations and problems they will have to confront and solve.

4—Testing and coaching. If trainees are working under a regular foreman or supervisor, occasionally he can give them daily coaching and suggestions on handling situations. Group meetings afford another opportunity for question and discussion of recent performance. Individual interview by the training director or personnel man in charge of the training program gives another opportunity.

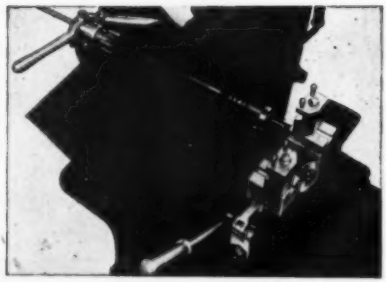
5—Follow-up by top management, through the foremen or the training head, after final selection and appointment of the trainees to their new jobs, enables them to take over on their own. They have at hand adequate help when necessary, without feeling that they are still tied to anyone's apron strings.

Motivation

There is no question that men and women will learn and progress faster if provided with a strong incentive to do so. Consequently, it is necessary to consider the incentive elements in your own situation and provide suitable incentives for the supervisor-trainees. These can be either financial or intangible.

If a trainee receives financial recognition as he makes progress, it urges him to still greater effort. It is especially desirable that some slight increase be provided within a relatively short period, say a month or two, after the training has begun. Working with a segregated group of supervisor-trainees, it should be relatively simple to start at a special wage below the regular rate for supervisors and still a little above the earnings they might receive as skilled workers, gradually stepping up as they show ability and produce results. If your plant organization and wage classifications are already established, the normal income expectancy

Multiply Lathe Production



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MATERIAL—Kind and hardness. Specific and complete information will raise no questions and will result in tools of longer life and better performance.

SHAPE OF CUT—Exact and complete dimensions including tolerances to be maintained. SEND A PART PRINT IF POSSIBLE.

LENGTH OF CUT—Exact distance each tooth must travel in contact with the work. This is very important and can best be told by a PART PRINT.

OTHER OPERATIONS—What operations precede the broaching? For instance, is the hole drilled or reamed and to what size? If there is any doubt about the best method of processing, we will be glad to make recommendations.

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DETROIT BROACH COMPANY

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can be made known to the trainee, so that he or she has some definite financial goal towards which to strive.

At the same time, intangible, or non-financial incentives carry greater potential weight than direct financial motivations. If the learner receives encouragement during the early stages of his training period, and can see the progress he is making—if he gets immediate recognition for good effort—if he has a chance to participate in group effort....the group discussions and training period serve as a stimulus, simply because segregation creates a certain feeling of being among the "elect". If there is an element of competition with other learners, a chance to ask questions, make suggestions, register complaints, etc., the learner will be stimulated to work harder and make greater progress. A good training program for supervisors, as well as for workers, will take both financial and intangible incentives into account and make use of both.

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Supervision

Only a small part of such supervisor-training can be done by the so called vestibule method. Most of it must be done under the watchful eye of existing top foremen, apart from the direct group work in classes or meetings.

The conduct of the top foreman handling such trainees is an important part of the intangible motivation of the learner. If the top foreman will go out of his way to check the learner's progress, to encourage him and help him, he will be insuring greater progress and quicker results. The top foreman should have had a part in making the original job descriptions and job qualification forms. He should have had a part in recommending candidates for supervisor training. He should feel that the whole program is his, and not simply an activity of the personnel or labor relations department. He should have a definite stake in the trainees who are under his care.

When second and third shifts are being added, when additions are being made to the plant, when employment is increasing and new departmental divisions and groups organized, the question always comes up:—"Where shall we find the foremen or supervisors necessary?"

Such a training program, coupled with proper selection and motivation, adequately supervised by both present top foremen and top management, is the answer.

CARBIDE TRAINING COURSE

As a result of the growing demand for sound training of carbide supervisors for industrial plants, Carboloy Co. Inc., 11139 East 8-Mile Road, Detroit, has made available a 12-page booklet (No. GT-155) on its factory-operated training course. This course, in operation for some three years, covers the various fundamentals involved in the design and application of carbide tools, including also brazing, grinding and tool handling practice.

Outlined in the booklet also are recommendations as to the types of individuals best suited for training to become "Carbide Supervisors" in industrial plants, and the curriculum of the complete one-week training course as developed by Carboloy.

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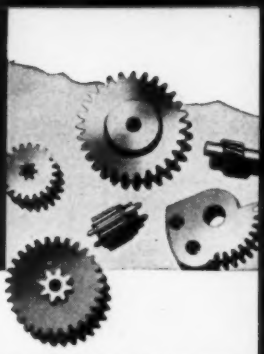

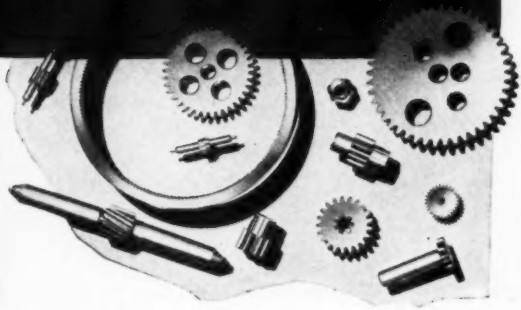

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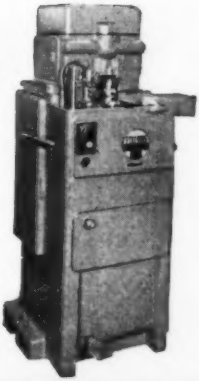
This 3-inch Fine-Pitch Gear Shaper is especially adapted to the cutting of gears and other parts for bomb and time fuses, range finders, meters, geared camera shutters, movie cameras and projectors, clocks, etc.



Cutter-Spindle Speeds up to 2,000 Strokes per Minute . . . enable this new 3-inch Fellows Gear Shaper to turn out small fine-pitch gears at rates hitherto unheard of. If you are making spur or helical, internal or external gears of small size, you will want a copy of the new Bulletin describing this machine.

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IF WORMS HAD WINGS, chances are our entire economy would collapse! All because their specialty—that of swallowing earth—is unique and indispensable!

The earthworms in a single acre of ground carry more than 18 tons of earthy castings to the surface in a year! Thus, by constant plowing, they make it possible for air, moisture and life-giving minerals to circulate...and so for all plant-life to flourish!

But if worms had wings, they'd never be satisfied with so plebeian an occupation as burrowing. They'd just fly around. And in the meantime, the whole world would go to pot.

The moral is plain: Specialization is of so great importance that our modern world could not survive without it. Our democracy could not fight without it. Take machine tool production. We have overcome Germany's 7-year head start in about a year, and are even now outproducing the Reich in machine tools in the ratio of 5 to 1.

A potent factor in this production miracle has been the multiple spindle automatic lathe made by Cone. These titans of the machine tool industry are currently used in the production of so many different munition parts it would be difficult to list them all.

Remember that ne[illegible] indle Lathe. It will continue to make history [illegible] ory is won!

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On the Nose

—with every pass!

The extreme accuracy of the Bakewell Precision Tapping Machine promises Class 3 or 4 gage fit threads with every pass of the tap—in any material from plastics to hard steels.

It's the exactness that has made the Bakewell indispensable to hundreds of war production concerns throughout the United Nations, cutting threads to strict Army-Navy specifications on a volume production never before possible.

SAVES CRITICAL MATERIAL

As the tapping operation is one of the last to be performed, such accuracy not only adds countless hours to the production schedule, but it saves thousands of dollars worth of critical material by eliminating costly rejects.

The patented combination of the Bakewell lead screw and solenoid actuated guide finger feed eliminates all possibilities of lead error. It does away with the backlash and compensates for the wear of the lead screw against the "nut." The tap acts only as a cutting tool.

SAVES HARD-TO-GET TAPS

And, in addition, there are many other features that should make your Bakewell pay for itself within 30 to 60 days after installation... The quick-to-operate positive limit switch that controls the thread depth to within 1/10th of a revolution; the double speed reversal that is still another time saver; the sensitive yieldable clutch that makes taps last three times as long.

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Now 4 models... No. 0—#0-80 to 8/32; No. 1—#4-40 to ⅜; No. 2—⅜ to 1½; No. 1 Radial.

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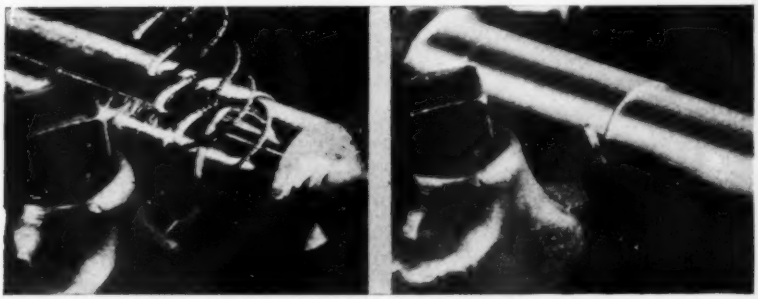
Fig. 1A (left) shows the rough turning operation on a bar of regular Invar, while Fig. 1B (right) shows the same operation performed on a bar of the new free-machining grade. Note the burred edges produced in machining the regular Invar.

A Free-Machining Invar

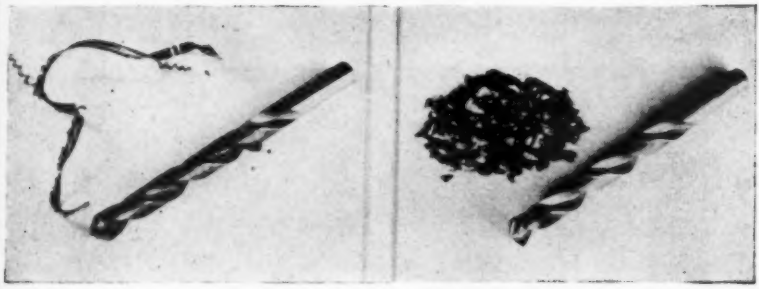
THE use of 36% nickel alloy known as Invar has long been limited by machining difficulties. The Carpenter Steel Co., Reading, Pa., report that this problem has now been overcome, with the development of a free-machining grade of Invar now in commercial production.

For some time, Invar, in various forms, has been used in applications where science must overcome or minimize the natural tendency of metals to expand when heated. By providing a rate of thermal expansion approximately one-tenth that of carbon steel, at temperatures up to 400° F., this alloy is contributing to the accurate operation of radio and electronic devices, aircraft controls, thermostats, etc.

Whereas regular Invar bar stock is extremely difficult to machine, the new type is claimed to machine easily, at a



Following the completion of rough cutting tests, finishing cuts were made on the same two bars (Fig. 2A, right, and 2B, left). This was done, not only to determine the fastest cutting speeds possible, but also to find the maximum speed at which the best finish could be obtained in each case.



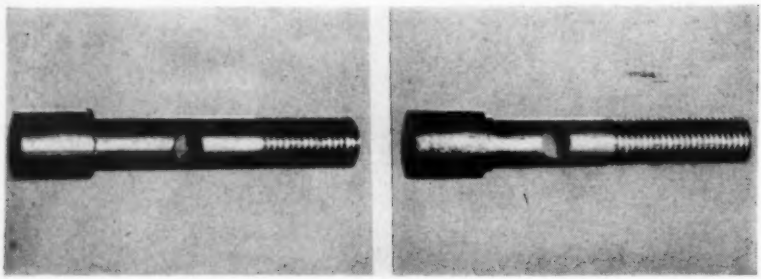
In the drilling test, a 2-3/16" thick block of each grade of Invar was used. The drill shown in Fig. 3A (left) cut through 1-1/16" of regular Invar and was badly burned. The drill in Fig. 3B (right) cut through the entire block of free-machining Invar without failing. The chips to the left of each drill are those produced in the respective tests.

saving of as much as 72% in machining time. The addition of selenium to the alloy gives it the free-cutting properties, yet does not alter the metal's low thermal expansion characteristics. Anyone familiar with the difficult machining properties of 18-8 stainless steel, before the free-machining type came into use, will have an idea of the difficulties involved in machining the regular type Invar bar stock. Actually, straight 18-8 is easier to machine than regular Invar, although this stainless work hardens while Invar does not.

Comparative Tests

To demonstrate the new alloy's free-machining properties, comparative tests were made on bars of both the regular and free-machining Invars. In these tests, standard high speed cutting tools were used, ground with standard angles such as regularly used in run-of-mine shop work. The accompanying Table 1 contains a summary of the results of these various tests. In all cases, machines and tools used for making these tests were identical.

The accompanying illustrations show details of the actual operation of these various machining tests. A study of them provides additional information regarding the relative machining properties of the two grades of Invar. For example, the differences in the chips



These unretouched photographs of test bars of regular Invar (Fig. 4A—left) and free-machining Invar (Fig. 4B—right) show that threads cut on the free-machining grade are smoother. Also, no burrs resulted from machining and drilling the free-cutting grade of Invar.

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TABLE 1
TESTS TO DETERMINE RELATIVE MACHINABILITY

	REGULAR INVAR (non-free machining)		CARPENTER FREE-CUT INVAR "36"	
OPERATION	SPEED	REMARKS	SPEED	REMARKS
ROUGHING (Bar 1" round) Cut: 3/32" Feed: .0055"	28.80 sur.ft./min.	Machining satisfactory.		
	49.22 sur.ft./min.	Tool failed after cutting about 1" along bar.		
	82.47 sur.ft./min.	Tool failed after only a few revolutions.	82.47 sur.ft./min.	Machining satisfactory. No effect on tool.
			137.45 sur.ft./min.	Top speed for the lathe used. No indication of failure. At this speed feed was increased from .0055" to .0125" with results still satisfactory.
FINISHING Cut: .050" Feed: .0055"	23.40 sur.ft./min.	Indications were that this speed provided the best possible finish.	111.67 sur.ft./min.	This speed gave a very good finish. With feed increased to .0125" the finish was still good.
	NOTE: This test made to determine highest speed possible for satisfactory finish.			
DRILLING 7/16" round high speed drills. Test block 2-3/16" thick. Feed: .004" per revolution.	665 RPM	Drill failed completely when hole was only 1-1/16" deep.	665 RPM	Drill went through entire 2-3/16" test block with ease. After test, drill still in good condition.
THREADING Single point tool. Ten threads per inch. Two roughing cuts @ .04". Two finish cuts @ .004".	60 RPM	Two rough cuts resulted in "torn" threads. Two finish cuts failed to provide satisfactory threads.	188 RPM	Same number of rough and finish cuts made. Threads greatly superior to those on regular Invar sample.
	NOTE: This test made to determine highest speed for best possible threads.			

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Micrometers cannot be replaced easily today — don't let yours be damaged — handle it with unusual care

The following suggestions will help save many a micrometer — make others last longer and serve better:

DO NOT measure revolving work.

DO NOT JAM the work against the anvil by forcibly turning the spindle. This may spring the frame or force the measuring surfaces out of line.

Unless micrometers have special measuring surfaces, **USE EXTREME CARE** in measuring over cutting edges, such as reamers and drills.

DON'T OPEN a micrometer by twirling it.

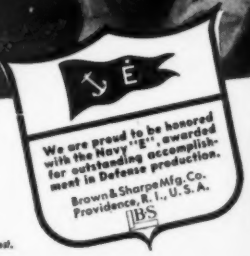
DO NOT LOCK the Micrometer Caliper at a particular setting and use it for long periods as a caliper gage. The measuring surfaces are too small in area to permit such use for a considerable length of time without excessive wear.

In the grinding room, **AVOID EXPOSING** your Micrometer Caliper to a flood of coolant containing grit or emery.

DO NOT CARRY your Micrometer Caliper in a pocket in which there may be dirt or grit. Keep it in its box when not in use.

KEEP the measuring surfaces apart when putting the tool away. If left together, moisture on them can cause rusting.

FOLLOW lubricating and adjusting instructions issued by the manufacturer.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IF you use cutting oils or coolant emulsions, your plant is subject to the possibility of a major cause of preventable absenteeism. Handling such materials involves dermatitis and other health hazards.

This subject is covered in detail in a new booklet just published. In addition to health hazards, it deals with direct economic losses involved and points the way to a new positive way of correcting such conditions.

The Dolge method substitutes scientific examination for guesswork. Competent laboratory examination of your cutting oils and coolants ascertains the facts on which a sanitation program, if indicated, is recommended. No charge for this service. Send for booklet describing the *Steridol* approach to coolant safety.

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produced and machined finishes are definite indications of the free-cutting properties of the new alloy.

New Applications

The low expansion properties of the newly developed free-machining alloy are said to be exactly the same as those of the non-free-machining grade. Thus, the new ease of machining will make possible many additional applications and increase the usefulness of Invar. Where precision parts with low thermal expansion properties must be machined in quantity, its free-machining qualities will help to increase output per man-hour. Then, too, it may help to effect mechanical improvements through better finishes and thus fewer difficulties in service.

The name given to the new alloy by its producer is **Carpenter Free-Cut Invar "36".**

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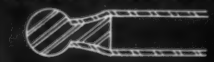
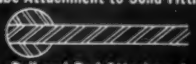


Tube Attachment to Solid Fitting



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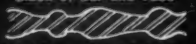

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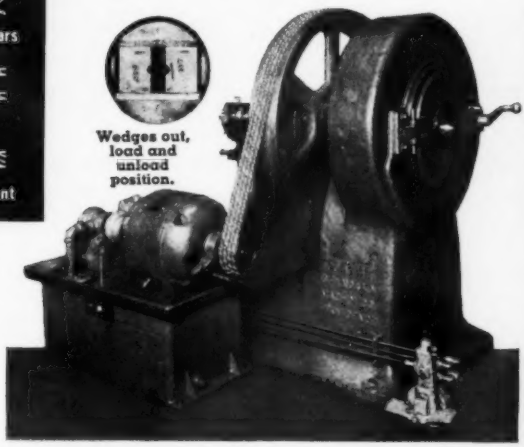
Wedges out, load and unload position.



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Producing Small Machine Tools

By H. A. FROMMELT*

THE small machine tool, in its field, is a precision instrument. Although frequently associated with the school and the home, it takes its place in regular manufacturing and even tool room work, often relieving larger tools on the smaller jobs. As such, it must be dependable and capable of producing accurate work. Thus the lathe shown in Fig. 1, which has a swing over the bed of 10¼" and a distance between centers in several sizes of from 18 to 36", has precision ground bed ways and custom built spindle bearings. It is equipped with instantly reversible power cross feed and power longitudinal feed; and it can cut threads from 4 to 96 per inch (standard). With these specifications, it is obvious that the production of this piece of equipment presents some interesting manufacturing problems. Particularly so if it is to sell at a figure in the lower price bracket.

Some few of the interesting and outstanding operations, including the fixtures, are described in a series of articles of which this is the first. Operations necessary for the production of vital parts of the Atlas lathe, milling machine, drill press and shaper are detailed in the descriptions that follow.

The Lathe Bed

The bed for the lathe (See Fig. 1) is shown in Fig. 2 and Fig. 3 set in a fixture on the table of a bed type milling machine. Nine surfaces are milled in one pass in this operation viz:—top, two sides and outside, underneath on each bed way, and in addition the pad for the carriage rack.

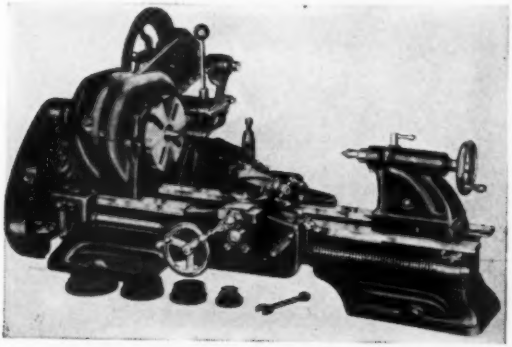

Fig. 1—Atlas "F" Series 10" Backgeared Screw Cutting Lathe with instantly reversible power cross feed and power longitudinal feed. Swing over bed is 10¼"; over carriage 6⅝". Spindle speeds are 16 in number, ranging from 28 to 2072 rpm. Four bed lengths are available.

*Director of Industrial Research, Kearney & Trecker Corp., Milwaukee.

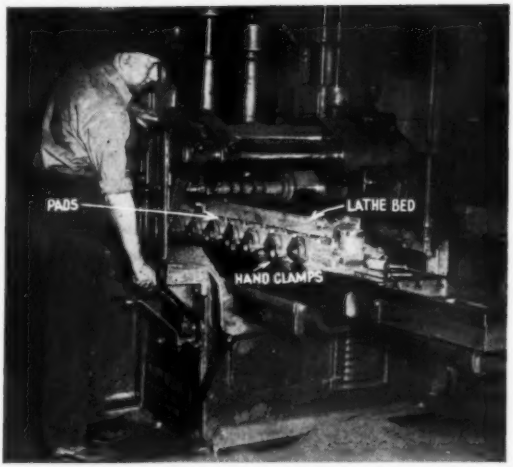

Fig. 2—Showing bed type milling machine with specially constructed head. Nine surfaces are milled in one pass in this operation.

This bed type milling machine is equipped with a specially constructed head as is clearly visible in Fig. 2. On the horizontal arbor are assembled four side milling cutters to mill surfaces "B", Fig. 4. The two vertical spindles are equipped each with one half-side cutter, to mill the top of the ways sur-

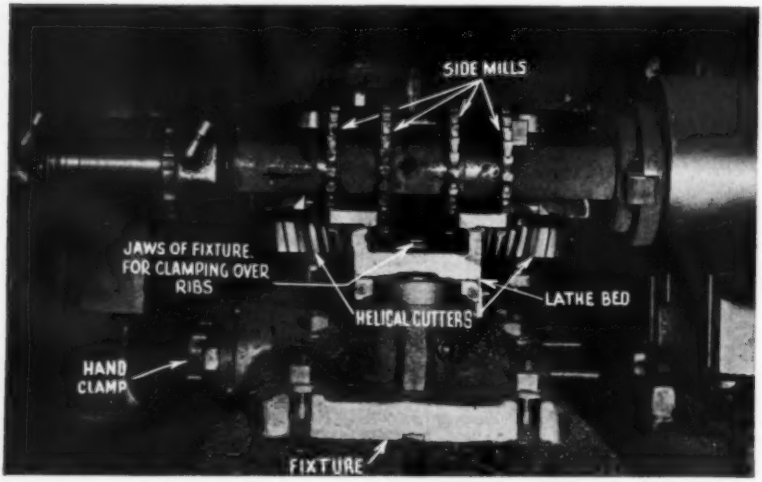

Fig. 3—Closeup of milling cutters and holding fixture.

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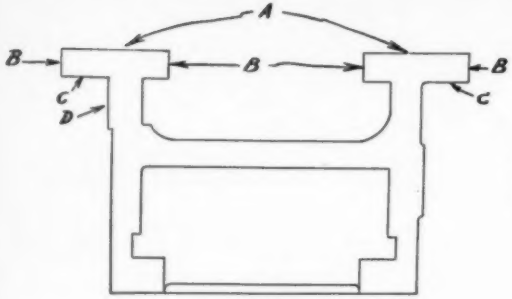

FIG.4

Fig. 4 — Section of bed showing the surfaces milled in the setup depicted in Figures 2 and 3.

faces "A", Fig. 4 and one solid side milling cutter to mill under the outside of bed way surfaces "C" and pad for carriage rack, surface "D", Fig. 4.

The fixture (See Figs. 2 and 3) is bolted to the table and the lathe bed, whose nine surfaces are to be milled, is set on locating pads visible in Fig. 2. Jaws clamp downward over the ribs cast between the bed ways. These jaws are brought into position and tightened by means of the hand locking devices shown in Fig. 2. The beds vary in length and include the 36, 42, 48 and 54" sizes. The number of ribs cast between the ways vary with the length, likewise the number of jaws that clamp over the ribs to hold the lathe bed rigidly while its nine surfaces are being milled in one pass.

The speed of both the vertical and horizontal spindles is 76 rpm. Since the high speed side mill cutters are ½ by 4", the face mills 1½" by 6" and the helicals 2 by 4", the linear velocity in this operation is approximately 76 and 114 feet for the 4 and 6" diameter cutters respectively The chip load is approximately .007".

The ways are chalked to provide a clew to imperfect castings during the first pass. The depth of the rough milling cut is .0625 or 1/16" while that of the finish milling is halved or .03125" (1/32"). (Finally, the ways are finish ground to .005" between the faces).

At a spindle speed of 76 rpm and a feed of 10.5" per minute, the 36" bed is produced at a rate of 8.2 beds per hour, while 5.3 of the 54"-long beds are laid down, completed, every hour. In other words, the actual milling time for the nine surfaces for example, on the 36" bed is 3.4 minutes. The total elapsed time from set-up to set-up is 7.3 minutes. Thus the operator requires less than 4 minutes to unload and load the fixture for each operation.

Such performance must be attributed both to the design of the head with its horizontal and vertical spindles making possible nine cuts in one pass, as well as the design and construction of the fixture. The former is largely responsible for the actual cutting time of 3.4 minutes (for the 36" bed) and the latter for the unloading and loading cycle of less than 4 minutes.

And yet at this production rate, a lathe bed is produced in less than 15 minutes (both roughing and finishing cuts), except for the final grinding operation, as a precision part for this machine tool (See Fig. 1).

The close limits to which the lathe bed is machined emphasize the basic idea of precision that is worked into these machine tools, built on a mass production schedule, to be sold in the lower price brackets.

(To be Continued)

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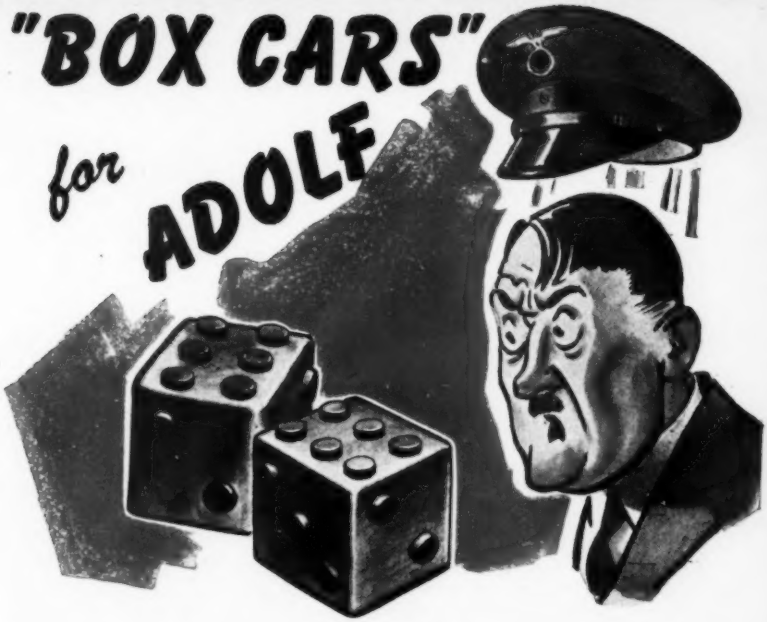

That odd name came from the shop where strange cubical structures are daily welded and machined. It is known that they are war material, destined to go on to other American workers who will fit them into structures for the defense of America and the defeat of the Axis.

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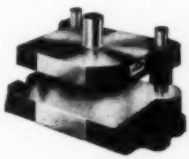

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Hydraulic Duplicating Equipment

By JOHN T. NEVILLE

ALTHOUGH the idea of using duplicating equipment in the machining of parts is by no means a new development, manufacturers of this type of equipment, during recent years, have introduced duplicating or following devices, so efficient they will have a marked effect on production standards that will follow the war.

The primary purpose of machine tool duplicating is to increase economy of production thru saving of time in machining operations. A second advantage lies in the fact that the usefulness of any standard machine tool can be extended to more diversified operations. A third but nonetheless imporportant advantage is that many normally difficult machining operations, including some die making, can be performed efficiently by semi-skilled operators. The valuable contributions of those three factors to our present war material production schedules, as well as to production requirements following the war, can be taken for granted.

Originally, duplicating devices were crude and more or less unsatisfactory attachments, operated by a system of weights which held down both tracer and cutter. They proved unsatisfactory principally because they failed to save sufficient time over individual machining. Subsequently, duplicators of a more modern and more efficient type, electrically impelled, were developed.

One of the more interesting and

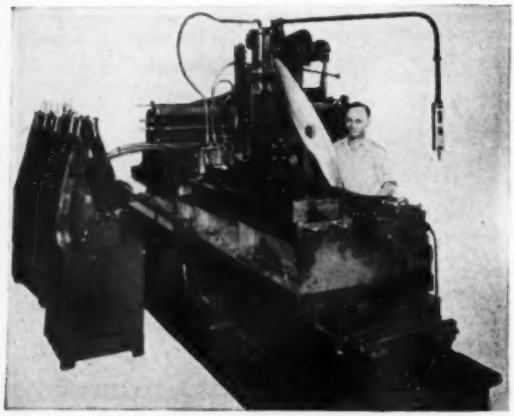

Fig. 1—Turchan Follower being used to machine a propeller blade on a Rockford Planer.

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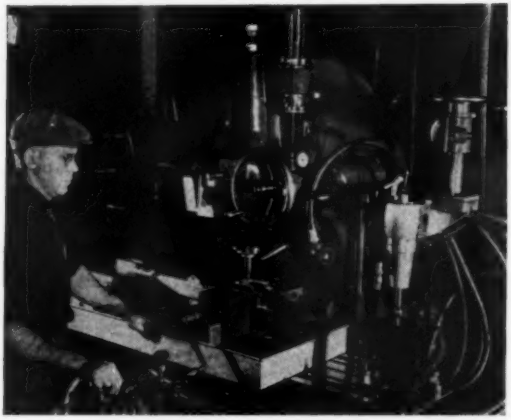

Fig. 2—Attached to a No. 3 Milwaukee Vertical Mill, Turchan Follower duplicates rectangular openings in trigger-box on breech casing of Oerlikon anti-aircraft guns. It is an extremely delicate operation, more than 150 others having gone before.

more simplified duplicating devices offered to industry within recent years, however, is the Turchan Follower, manufactured by the Turchan Follower Machine Co., Detroit, Mich. Unlike other duplicators produced today, the Turchan follower is one hundred percent hydraulically operated, except for an electric motor used to operate a fuel pump. Its salient feature is the extreme simplicity of its construction and operation, together with the ease with which it can be effectively employed by comparatively unskilled machine tool hands.

The Turchan Follower is an attachment to a machine tool—a device that can be attached quickly to any standard type of lathe, shaper, grinder, planer, milling machine or boring mill, making it capable of duplicating from any model, pattern or template. Conversely, when direct machining is desired, it can be quickly disengaged and is so designed that it interferes in no way with regular use of the machine. The Turchan, furthermore, does not utilize a machine's feed or lead screw, all movements of the table or tool being controlled hydraulically under actuation of the device's tracer control valve. The hydraulic control may be applied to the table or the cutter, which gives the duplicator a wider, more diversified machine tool use.

Probably the most interesting part of the Turchan follower is the tracer mechanism. This ingenious device, when pushed in and sprung out by the contour of the model or template being traced, meters oil into a cylinder this oil flowing into whichever side of the piston the contour calls for. Thru a connecting rod hook-up the piston, in turn, actuates either the table or the tool, and thus permits the cutter to reproduce in metal an exact replica of the model being duplicated.

Operation of a Turchan equipped machine is semi-automatic, but control is so simple it can be learned quickly by any good machine tool operator. Once the electric motor is started and the tracer brought into contact with the model or template, the operator merely has to watch one control wheel thru which he changes the direction of feed. Duplication of the form of the model or template is controlled automatically by the tracer. Completion of any given part with the device is surprisingly rapid as compared with individual machining. Oftentimes an operator's main job will be loading and reloading parts. The value of such an accelerated production is accentuated, when highly trained production hands are at an ebb.

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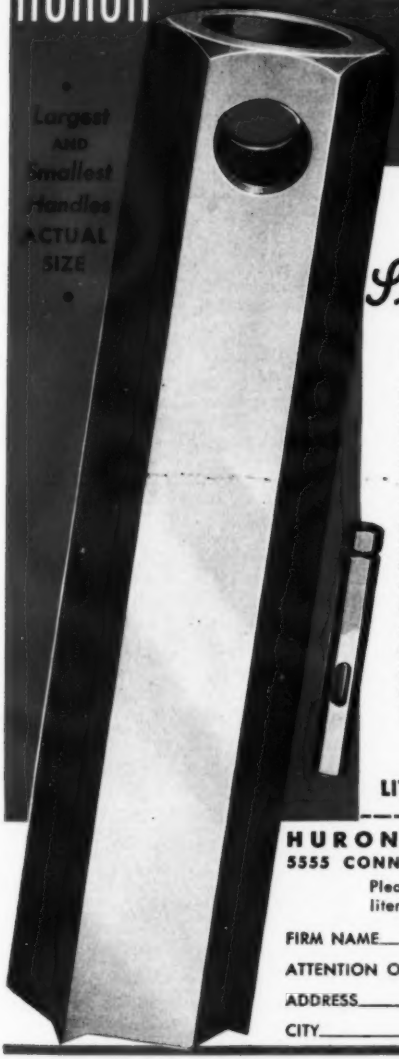

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Fig. 3—Another view of the Turchan Follower, duplicating the Oerlikon trigger-box.

Altho Turchan Followers can be applied to almost any standard type machine tool and hooked up to any type of current, regardless of rating, the company does not attempt to operate a production line. Turchan officials prefer to engineer and build each duplicator to fit the specific purpose for which it is intended. By producing "tailor-made" machines and often doing so in cooperation with various machine tool manufacturers, they feel the completed whole (machine and attachment) will be more efficient, more esthetic and more satisfactory to the ultimate owner. Turchans can be and are being built for one, two or three dimensional operation. The company, thru its engineering department, sees to it that each attachment is properly fitted to the machine for which it was built and that the purchaser's operator is thoroly schooled in its operation.

Turchan followers are made to reproduce dies and parts, ranging from small dies a few inches long to automobile turret top dies or even tank turrets. One large manufacturing company with approximately 50 of them in use, employs them to reproduce connecting rods, the inside contour of pistons, exhaust flanges, wheel cases, cylinders and other airplane and marine motor parts. Another company, owning one of the largest duplicators ever built, has a Turchan Follower mounted on a No. 780 Giddings & Lewis boring mill. Prior to the shutdown of automobile production, this giant machine was employed in the milling of turret top dies. Turchan officials say it is being used today for quite another purpose—one which we may not mention because Hitler may be listening.

There is no secret, however, about the use of Turchan duplicators by still another company in the building of 20 mm Oerlikon anti-aircraft guns. In this plant, Turchan Followers, attached to vertical spindle milling machines, are being used to advantage in the milling of trigger box openings. This slot, located in the breech casing, offers a highly complex machining task in which tolerances are held to limits of .001 inches. The officials installed the duplicators to eliminate the possibility of workmen, thru a slip of the

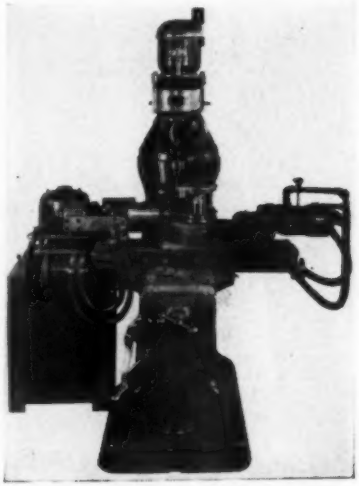

Fig. 4—Here the Turchan Follower, attached to a Bridgeport Turret Miller, is profiling a carburetor.

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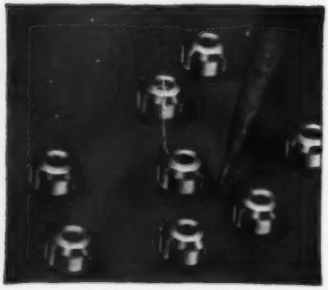

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hand, ruining a breech casing upon which some 150 intricate machining operations already has been performed. Turchan followers, tracing a perfectly machined piece, do not permit the cutter to stray from the precise dimensions of the model.

Turchan Followers are being employed as well in other war plants to speed production, reduce rejects and be useful to workers who have had little or no experience in machine shop tolerances. Turchan officials contend their Follower will increase production of any given part from 3 to 20 times over the tedious job of turning out such parts by individual machining.

Another interesting fact about Turchan duplicators is that the company strongly stresses freedom from any need of high priced oil in the cylinders, which are unusually large for hydraulic control. On the contrary, Turchan specifically recommends the use of an economical Standard oil costing 17 cents a gallon. Oil pressure within the system is kept constant at pressures ranging from 120 to 200 pounds psi, depending upon the machining job at hand. The average Turchan Hydraulic Unit has a capacity of 55 gallons.

Amid conditions under which industry is operating today, when production of war material necessarily must be as rapid as American machinery and ingenuity can make it, when the dictates of all-out warfare force improvements and model changes overnight, and when new dies, new parts and new products are constantly being demanded, Turchan duplicating devices are proving their worth.

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Popular all around production Saw.

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Heavy duty production Saw.

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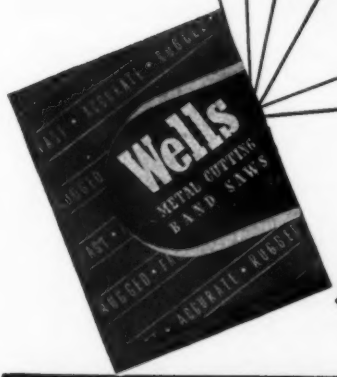

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THE SYMBOL of *Clean* AIR

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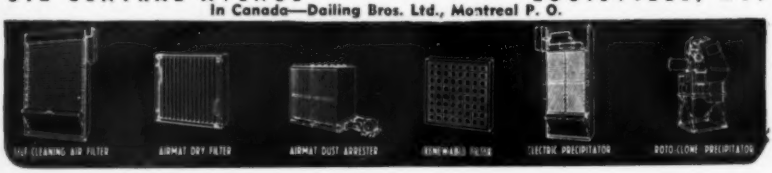

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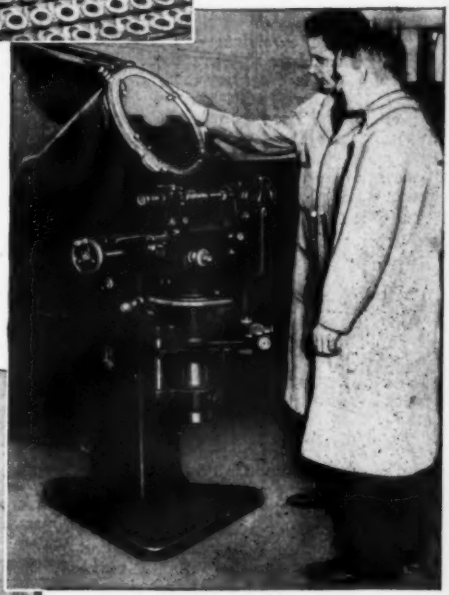

Profit-Producing J&L *Machine Tools*

PREVENTIVE MAINTENANCE

Keeps Machine Tools Running

By H. B. COLLINS*

MAINTENANCE of machine tools is one of the most important steps in speeding and sustaining our war production effort. War production may be seriously delayed or interrupted by breakdowns of electrical equipment. To insure the absolute minimum of breakdown time, it is essential to familiarize maintenance men with the equipment and circuits. They should be trained to detect troubles that may occur and to avoid as many as possible thru preventive maintenance. We are well aware that not all breakdowns can be prevented, but by a well planned schedule of cleaning and inspection some 80 per cent or more can be avoided.

Cost of maintenance has been proved to be justified by the continuous operation of machine tools. Maintenance generally means repairing. Preventive maintenance means preventing breakdowns, thus reducing cost and lost time.

An inventory of electrical equipment should be made, noting the types of motor control equipment, and available renewal parts. Whenever possible, spare parts of these types should be kept on hand:—Control equipment, such as starting panels with all movable contacts, magnet coils, and shunts; spare motors, particularly special types; and a complete line of coils, brushes, brushholders and bearings. The cost of these parts is relatively small compared to the loss of time in production due to shutdowns of machine tools.

Fig. 1—Removing oil and grease prevents excessive accumulations of dirt.

A card file such as illustrated, will prove helpful in maintenance work. The record card contains the most important information on the electrical equipment. This card refers to all electrical equipment on anyone machine tool. Spare parts information can be carried in another file or equipment parts catalog.

Any periodic inspection should be

*Factory Service Division, Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

DoAll PRECISION GRINDER

Smooth AS A MIRROR EVERY TIME

● Especially designed and built with one purpose —to do the difficult task of super accurate grinding, so essential in our mass production program of today which calls for interchangeability of hundreds of vital parts.

The engineers worked for years to refine DoAll performance. Vibration is practically eliminated through rugged construction. Bearings are of larger area and hand scraped. Every part is so perfectly co-ordinated that you are assured of accuracy not only to size, but to flatness and parallelism.

GRINDING AT ITS BEST

For that final operation—a smooth, mirror-like finish —a finish that will pass every rigid inspection test— that will make a surface accurate to less than a ten thousandth of an inch, investigate the DoAll.

When the finish is so perfect that you can actually "wring" two flat surfaces together— well, that's super grinding—and that's what the DoAll has to offer. Adaptable to either wet or dry grinding.

Send for descriptive literature.

SAVAGE TOOL COMPANY
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DoAll Branches in 25 cities, each in charge of a trained sales engineer to give you quick service on Grinders, Gage Blocks, Contour Machines, Band Saws and Files. Consult your phone book.

noted under "Remarks" and all repairs should be recorded. Thru this information, the more frequent causes of breakdowns can be studied and preventive steps taken to reduce such troubles.

Motors Must Be Clean and Dry

It is important to keep motors clean and dry. Accumulations of dust and dirt have caused numerous fires, damaging equipment and resulting in costly delays. Suitable precautions should be taken to protect the motors from oil, dust, acids, grease and moisture. Dust can be removed by blowing out with an air hose, using ordinary shop pressure. In extreme conditions, dust proof motors are recommended.

In making a thoro inspection of motor equipment, the armatures should be removed. Windings should be cleaned with a solvent to remove grease and other dirt. In case of loose windings, the armature should be preheated in an oven 85-100 degrees C. The varnish used should be kept at the proper viscosity recommended by the manufacturers. Immerse the armature end-wise, commutator end up and allow to drain before baking. Bake armature also in end-wise position using temperatures recommended by the manufacturers. Such periodic treatments are recommended even tho the equipment is not subjected to extreme conditions. This treatment will prevent windings from drying and prevent loosening. Coil bands should be inspected, and loose bands repaired.

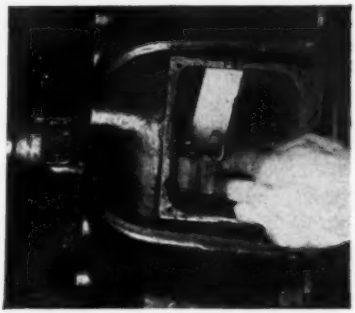
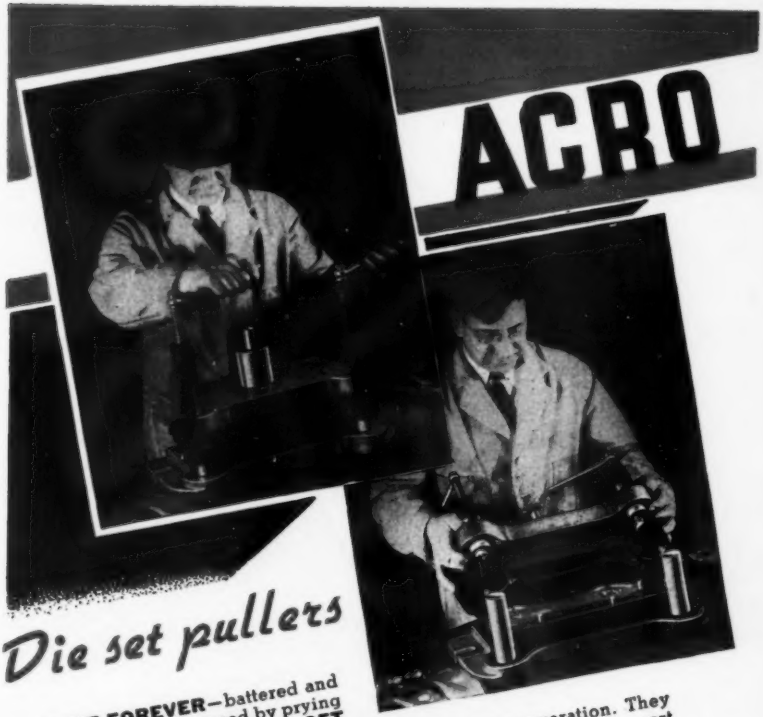


Fig. 2—Clean brushes are necessary in obtaining proper contacting surface.

Resurface Rough Commutators

The commutators then should be inspected. A great many motor failures are due to rough commutators. Spark-

Fig. 3—Removing accumulations of dust and dirt has prevented numerous fires.



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ACRO PULLERS are indispensable for the grinding, mounting and fitting of punches, enabling the operator to raise punch from die easily, quickly and smoothly, positively holding the set at any desired height.

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ing at the brushes is usually caused by commutator roughness. As a result, the commutators instead of wearing bright and smooth, become dull and pitted in appearance. Under such conditions, the brushes do not make good contact and excessive heat is generated. Excessive heating of the commutators may cause soldered connections to melt. The proper way to correct rough surfaces of commutators can be determined by the conditions. Where the surface is exceptionally rough, the armature should be removed from the motor and the commutator turned on a lathe. A lesser degree of roughness may be rectified by an ordinary commutator stone, or sandpaper held on a block of wood cut to cylindrical shape of the commutator. This may be done while motor is in operation.

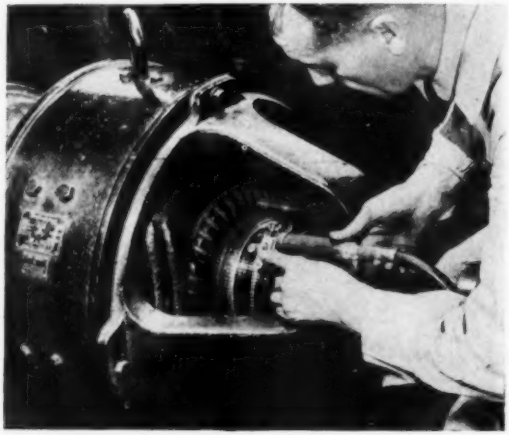


Fig. 4—Undercutting or slotting of a commutator where necessary, prevents excessive sparking.

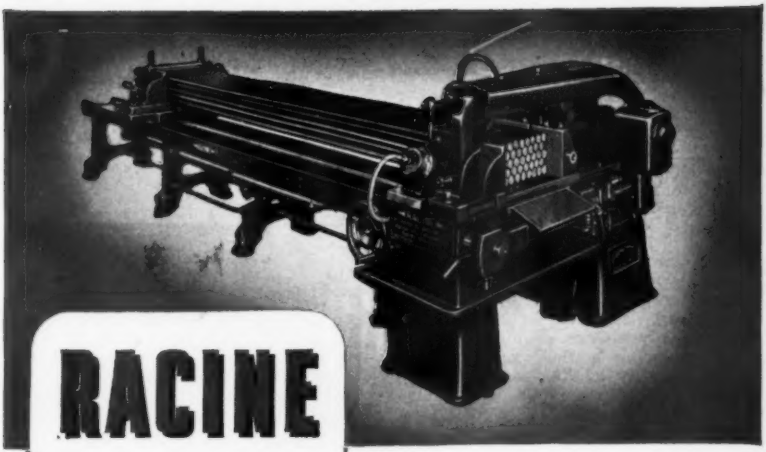
There seems to be a prevalent idea that slotting of a commutator will cure all troubles. This not true, altho slotting does take care of certain specific troubles, such as mica between the copper segments working up. This is known as "high mica." As the copper wears, it leaves a hard mica high. The commutator should be slotted 1/16" deep, to correct this condition.

It is well to inspect and clean commutator bars frequently to insure best results. There is always a chance that small particles of copper dust and oil may be deposited and cause short circuits.

The most common causes of sparking of brushes are:

Overloads.
Brushes not set exactly at point of commutator or off neutral.
Brushes may be wedged in holder.
Brushes may not be fitted to circumference of commutator.
Burned on ends.
Not sufficient pressure.
Dirty and oily commutator.
Vibration.

Sparking may also come from an open armature circuit. The most easily detected symptom is vicious sparking when machine is in operation. It is unlike any other sparking because the resulting spark is long and heavy and appears to extend the entire circumference of the commutator. A bright spark will also occur each time the break passes the brush. Opening may be in the windings of the armature proper, or may be a loose or bro-



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Modern designing of Racine saws produces these outstanding features. Hydraulic control allows complete range of feeds—positive progressive and self-compensating progressive. Single lever control—inexperienced help can operate. Extra heavy pivot shaft and wide pivot bearing construction in arm of Saw Guide prevents cocking or binding strain in bearings and ways.

Racine's complete line includes models for general purpose and production cutting in a wide range of prices and sizes. Capacities 6″x6″ to 20″x20″ Automatic Stock Feed Machines, as illustrated, are also available.

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Speed up the production of your power operated equipment with Racine Variable Volume Oil Hydraulic Pumps and Valves. Pressure from 50 to 1000 lbs. per sq. in. for holding, pressing, clamping, feeding and forming operations.

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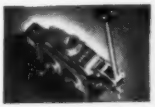
Our Engineering Department will be glad to help you work out your hydraulic application problems. Address your request for complete information to Dept. MT-S



Four-way Hydraulic Valves are available with stem, lever, roller, latch, foot treadle and solenoid operating devices. Various porting arrangements can also be furnished to suit requirements.

Racine's exclusive "Sleeve Type" Hydraulic Valves have balanced pistons. Made in ⅜″ to 1½″ standard pipe sizes. Continuous bearing and sealing surface—piston cannot sag—always in alignment—insuring longer valve life.

RACINE TOOL and MACHINE COMPANY

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ken connection, where armature bar is soldered to the commutator bar.

Where the break is from a loose connection, it may be resoldered. If the open circuit is within the winding, a temporary repair can be made by bridging the portion with a copper shunt. It should not be done for extended periods, and as a general practice I don't think this should be encouraged.

Over-heating of field coils may be caused by a speed that is too low, voltage too high, short circuited turns or overload. The field coils can be replaced easily. Care should be taken when replacing a field coil that the proper polarity of the coil is maintained.

Watch Bearings and Lubrication

Bearings and their lubrication are of the greatest importance regardless of size of apparatus. The bearings of the motor must be kept clean and free from dirt. They should be examined frequently to see that the oil supply is properly maintained.

If bearings become hot, reduce the load on the motor and feed lubricants freely, being careful to prevent oil from reaching the windings. This is done so that the bearings may not freeze. When possible, under these conditions, the motor should be dismounted and examined.

Keep Contactor Surfaces Smooth

Maintenance of control equipment is important in realizing full time operation of equipment. Periodic inspection is needed, plus cleaning and smoothing contacts with sand paper. No general rule can be made as to frequency of inspection.

The use of oil on the contacts should be avoided. Oil and grease quickly collect dust, and unless parts are frequently cleaned this will interfere with the operation. Oil and dust will also cause arcing between contactor points. If copper shunts become badly burned and corroded they should be replaced during inspection.

Smooth contractors are necessary to obtain the proper contact surface. Contacts can be smoothed by use of sand paper. Some heavy arcing and burning may be found, and in such cases, contacts can be dressed up with a file. Caution should be taken not to use emery cloth. (Emery is a fair electrical conductor.)

Fig. 5—Proper oiling of bearings is of the greatest importance.

Spring tension should be maintained to allow contacts to make a firm connection. This should prevent pitting, heating and oxidation. Spare contacts and springs should be carried for replacements. All connections should be checked as loose connections can cause many delays. The contacts should be set to make and break at the same time. With proper care, contactors will last a normal life in general usage. Magnet coils on a-c control may cause humming. If this becomes excessive, it may be caused by:

1—The sealing surface of the magnet may be corroded, thus preventing perfect sealing.

GRAND RAPIDS No. 10-B

COMBINATION TWIST DRILL AND TAP GRINDER

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Other Combinations also available

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This precision machine tool not only conserves Hi-Speed Taps and Drills but also assures more accurate holes between regrindings.

Sharpens Taps, 2, 3, and 4 Flute, Right or Left Hand. Sizes No. 6 to 1½ inches.

Sharpens Drills, 2 and 3 flute, Straight or Taper Shank. Sizes ⅛ to 1½ inches.

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2—The mechanical parts may be out of line, preventing the contactor from finding a square seat.

3—The voltage may be low.

4—Spring pressure may be high.

No-fuse breakers or switches that require fuses cause little trouble. The usual fault found is an overload. Continuous trouble can only be rectified by inter-changing trip units of a higher load capacity, or increasing the fuse capacity on fuse type switches.

Overloaded Secondaries

Little has been said about maintenance of the main power source of secondary lines. With increased production and more machine tools, many secondary units are overloaded, sometimes causing shutdowns of entire sections. The allowable load of a bus line or secondary should be noted, and an increased load demand should be taken care of immediately. Maintenance of individual machine tools is important, but breakdowns on main circuits can cause considerably more loss in production.

The main breakers should be cleaned and inspected every six months to insure uninterrupted performance. This may mean a shutdown of power for several hours during the inspection period, but may compensate for itself in preventing a breakdown.

The care of insulating oil in circuit breakers is of utmost importance in their successful operation. Contamination by dirt, moisture, etc., reduces the strength upon which the operations and current interrupting ability largely depend. Consequently the utmost care should be taken to keep the oil clean. The oil should be given a dielectric test which should show a minimum of 18,000 volts measured between 1" diameter discs spaced 1" apart. The entire inside of breaker should be cleaned when tanks are dropped and care should be taken to prevent dirt and dust from falling into tank. When tanks are dropped the inspector should look for sludge, removing any that may have accumulated.

Contactors of the main breakers should be inspected for wear. Where slight wear is encountered it may be dressed with sandpaper. Excessive wear may be dressed by filing. Caution should be taken not to use emery paper. Any filings resulting from cleaning should be removed as they might cause pitting and burning. Badly burned contacts should be replaced to insure continuity of service. Fingers and springs should be inspected and replaced where necessary. Records have proved that replacing breaker parts is less expensive than making repairs. Periodic inspections and records should be kept of all breakers, showing dates of inspection, oil checks, and repairs.

(Photos—Courtesy Westinghouse Electric & Mfg Co., East Pittsburgh, Pa.

Machine Tools			Location
Machine Tool No.			
Type Motor	Motor No.		
H.P.	Amp.	R.P.M.	Volt
Breaker Style No.			
Starter Style No.			
Misc. Equipment			
Date Inspected			Remarks

Typical File Card used in maintenance records.

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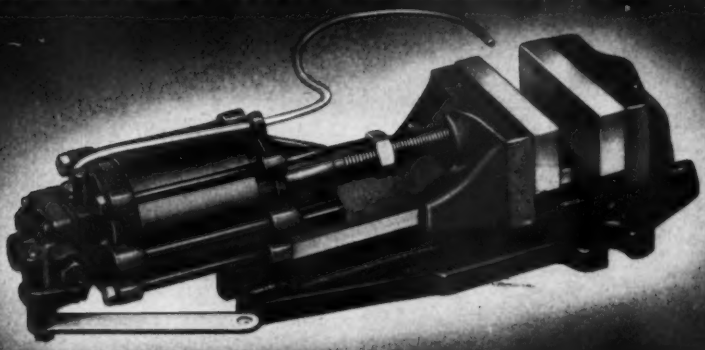
THIS *Senacon* AIR-VISE *SYNCHRONIZES* WITH THE MACHINE TOOL CYCLE

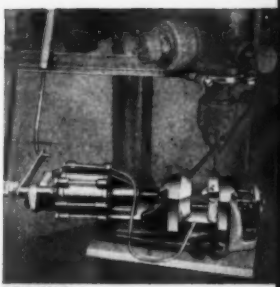


Saves Time . . . Cuts Waste Motion . . . Speeds Productio

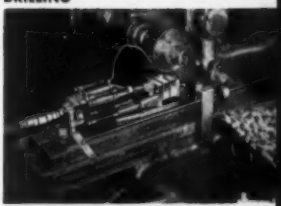
THE SENACON AIR-VISE opens and closes in *automatic synchronization with the main machine tool cycle.* It provides for smooth, fast machining and mass production of workpieces in drilling, reaming, tapping, milling, sawing, filing, etc., and eliminates the waste operator motion required with ordinary hand vises!

A FULLY CONTROLLABLE PRODUCTION TOOL

Simple drag link connection from Air-Motor to a moving part of the machine tool synchronizes vise opening and closing. Motor valve operating lever operates *from any angle in any plane.* Dual-exhaust air streams provide for blowing dirt and chips from the work area, ejecting workpiece, operating feed hoppers, etc.



DRILLING



MILLING: Note the simple drag link conne tion between valve lever and main machi tool element in the above installations, and u of exhaust air blast to clear work area of chi

SPECIFICATIONS:
Two False Jaws—⅜" x 1½" x 4"; maximum Jaw opening—2¼"; total thrust—500 lbs. at 100 lbs. air pressure.

PNEUMATIC MACHINE TOOL DEVICES

Write Dept. B for SENACON Bulletin 101 which tells how SENACON Controlled Air-Power Devices are speeding production ...cutting costs...increasing shop efficiency.

SMITH-JOHNSON CORPORATION
BENDIX BUILDING LOS ANGELES, CALIF.

SPEED PRODUCTION WITH CONTROLLED AIR PO

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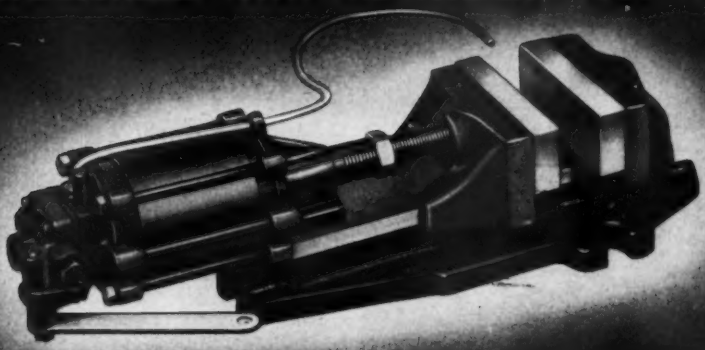

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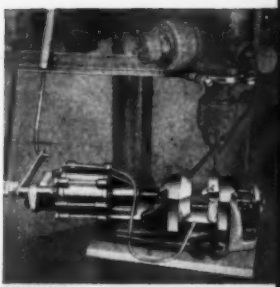

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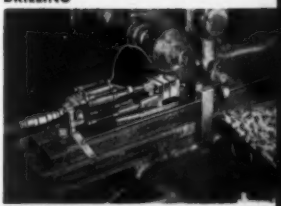

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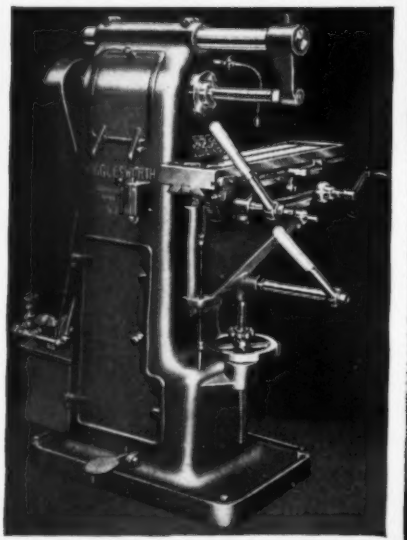
Hits the Mark

THE NO. 3 WIGGLESWORTH SMALL MILLER



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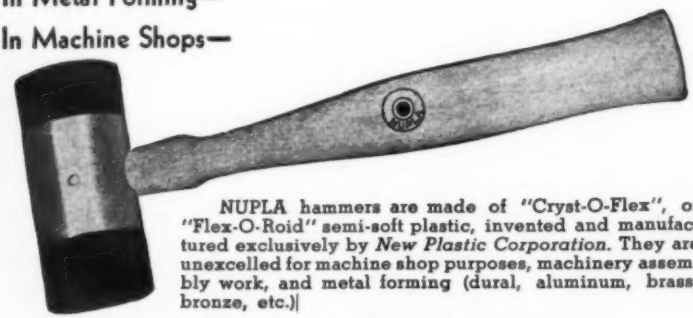

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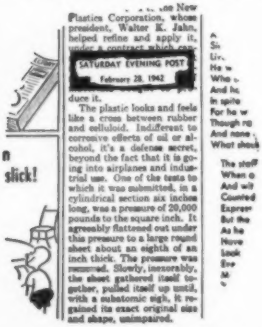

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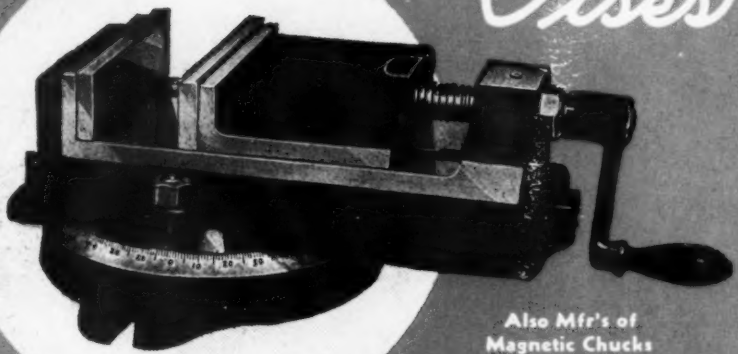

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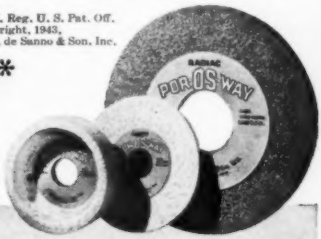

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Wire Retainers and Snap Rings

In Three Parts—Part III

By H. F. WILLIAMS

THIS final installment of wire retainers and snap rings deals with both round and flat wire types, relative to design features and successful applications. Common sense rules for assembling and disassembling, care, storage and use will also be discussed.

Regardless of the shape of the material of which the retainer is made, means must be provided for convenient methods of assembling and disassembling. As explained in connection with Fig. 4, which appeared in the June, 1942 issue, a wedge-shaped instrument can be used to expand an external application ring. This method however is not so successfully used when the retainer is made of larger diameter wire. Both ends of the wire must be so formed as to provide a place for engagement of the removing tool. In the round wire retainer illustrated in Fig. 31, the ends are turned back so as to form two prongs, between which the tool can be inserted for expansion. Although the ends may be formed straight or parallel with the vertical centerline, there may be some objection to these projecting ends. Such a design should not be used where it might cause injury, or where cleaning rags or waste could be caught. This type is also applicable to internal locations if a slot is provided for the protruding ends.

In Fig. 32, a better design is shown for internal applications. Here the ends of the wire are turned inwards, so that the pliers used for removing the ring, can be placed over the outer edges of the ends and the ring contracted. Both types in Figs. 31 and 32 can be made of round, square or rectangular wire.

The design shown in Fig. 33 has a protruding loop for the insertion of a pulling tool. If the ring were used for an external application, there would be temptation to pull it off when disassembling. This would cause the ring to be expanded enough to pass the nibs over the full diameter of the grooved work. If such were the case, either the ring would break from overstressing the material, or it would take a permanent set making it worthless. However, on an internal application, the pulling loop is handy for removal, the ring being contracted only half the wire diameter per side. In some applications of this type of ring, the loop is bent upwards from the flat plane, facilitating insertion of the pulling tool. When used internally, a slot must be provided for the loop side and the nib side as well.

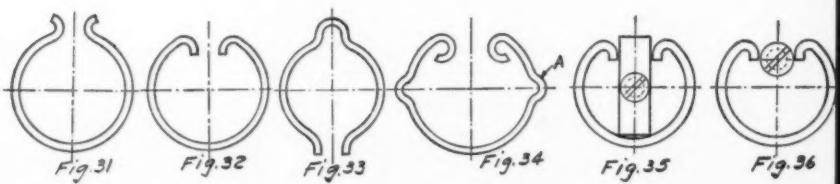

Fig. 31 Fig. 32 Fig. 33 Fig. 34 Fig. 35 Fig. 36

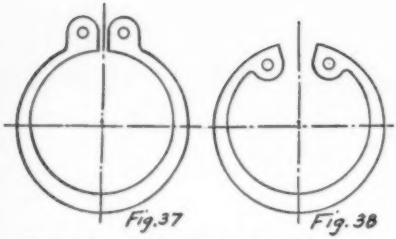
Fig. 37

Fig. 38

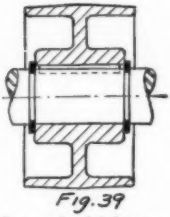
Fig. 39

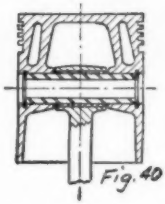
Fig. 40

While the illustration in Fig. 34 shows a comparatively small ring, this retainer can be made quite large. Either two or three protruding loops, as shown at A, can be used, these loops snapping into slots in one of the members to be assembled. In this case, the main body of the ring is not the retaining element but only a connection from one loop to another. For instance, a sheet steel cover of the dished type can be retained in a hole with such a ring. It need be contracted only enough to withdraw the loops from the engaging slots for removal of the cover.

There are some installations utilizing wire retainers, especially where the ring has to withstand considerable end thrust. It is therefore necessary to provide a positive means of retention of the ring. Although a rectangular wire is used in Fig. 35, round wire can be used equally well. This ring is shaped much like that in Fig. 32 for internal applications. To keep the wire ends from closing in during operation and thereby snapping the ring out of engagement with its mating part, a rectangular key is provided. This key is of equal thickness to the wire and is held in place by a screw of a desired type. When the key is in place, the wire ends cannot be contracted inadvertently to release the snap ring.

To simplify the means of ring-locking just described, the key can be eliminated entirely, screwing the fillister head screw into the shaft or stud at a point opposite the loop ends as shown in Fig. 36. It will be seen that when assembling the ring, it must be so positioned that the head of the screw can be entered between the loops. This however is not necessary in the preceding design where the screw is in the center of the shaft or stud. If vibration is present, it is well to add some type of spring lock washer under the screw head. While there are other methods of securing the screw used to retain the key that holds the retaining ring, it is obvious that the means of retention become so involved as to warrant a design of a different nature, thereby replacing the snap ring altogether.

In 1937, a new type of so-called wire retainer appeared on the market in Eng-

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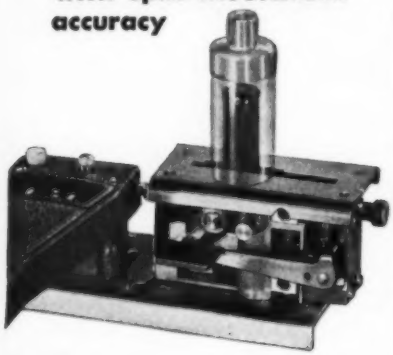

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land. It is illustrated in Figs. 37 and 38. and is known as the Seeger Circlip, being manufactured by the Automotive Engineering Co. Ltd., in England. The idea behind the radical departure from the conventional design of wire retainer was to obtain as nearly as possible, 100 percent contact between the ring and its component groove.

As can be seen in the illustrations of which Fig. 38 is the internal type, Fig. 39 being used for external applications. the cross-section is non-uniform in shape. By thinning that portion of each ring near the open ends, it is claimed they will retain their circular form regardless of how much they are expanded or contracted. The holes in the lugs are for the insertion of round nose plier ends used when assembling and disassembling the rings.

The circlips are punched from cold rolled strip stell and are hardened and tempered. The material used contains .80 percent carbon, .16 percent silicon and from .50 to .60 percent manganese. The phosphorus and sulphur content is .037 maximum. When hardened and tempered, these rings have a tensile strength of 200,000 lbs. per square inch and test C-45 to C-52 Rockwell hardness. They are made up to 6" in diameter. The outside diameter of the internal type is ground, as is the inside diameter of the external type. Both faces are ground when it is necessary to maintain close tolerances on the thickness of the finished ring.

In the next four illustrations are a few of many applications of these Circlips. In Fig. 39, the rings are used as locating shoulders. This makes it unnecessary to perform a turning operation on the shaft and thereby saves material and labor. If end shake is to be avoided, it is necessary to use surface ground rings while the hub of the pulley must be held to a comparatively small tolerance in length.

Prior to the advent of the Circlip, ordinary round or rectangular wire rings of uniform section had been used to retain "gudgeon" pins, commonly referred to in this country as connecting rod pins, in pistons of various types of internal combustion engines. Because an

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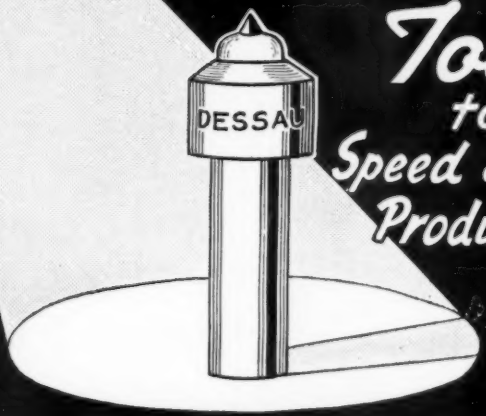

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engagement of a nearly complete circle was desired, which was not possible with ordinary rings, the newer type of ring was conceived. With this application (Fig. 40 as in the preceding design) accurate positioning of the groove in the piston and pins held to close limits of length will result in quieter running engines.

Connecting link assemblies as shown in Fig. 41 are made more neat by the use of a flat ring instead of a round wire ring, cotter pins, or a combination of headed pin, washer and cotter pin. Only sufficient length of pin is required to have chamfered ends and the width of two grooves for two thin Circlips.

In Fig. 42 is shown the application of such a ring for the retention of a ball bearing. Although the shaft is shouldered and a bushing used at the other end, it is possible to make use of four rings if desired, two on the shaft and two in the housing.

As stated previously in this article, the use of snap rings, regardless of design, will save drawing time, material, machine and assembly time. In one gear shaft arrangement (not shown) comprising a shaft, two fixed gears, two ball bearings and one idler gear mounted on two additional ball bearings, the use of these rings resulted in marked simplification. Five retaining rings replaced 12 other parts including a nut, three washers, two sleeves, a screw, three studs, a pin and a screw lock. Smaller diameter and shorter stock was used for the shaft and considerably less turning, threading, grinding, drilling

Fig. 41

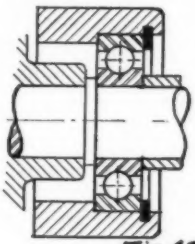

Fig. 42

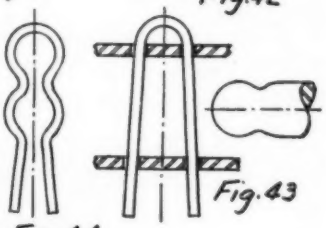

Fig. 43

Fig. 44

Fig. 46

Fig. 45

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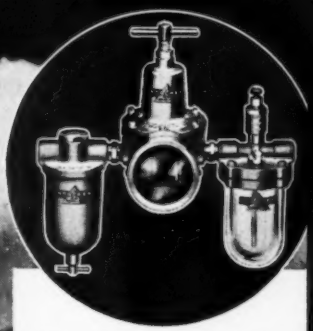

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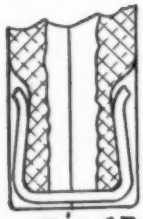

Fig. 47

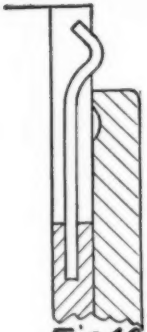

Fig. 48

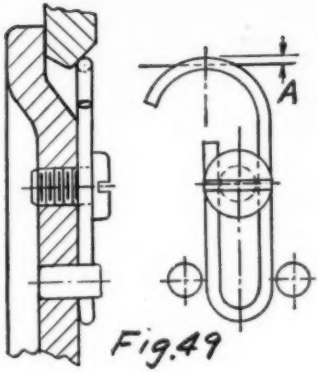

Fig. 49

and tapping were necessary than with the former methods.

Holding, fastening, retaining or locking with wire is accomplished with shapes and forms other than circular or partially circular. In Fig. 43, a piece of round wire is bent in the shape of a hair pin with straight legs spread slightly apart. These legs are inserted into the holes of a small sheet metal bracket drilled for freedom of the spring. A steel pin with spherical end is grooved directly behind the ball end. It is riveted into one of the members to be held. The ball end spreads the spring retainer enough to allow the legs to engage the groove in the pin.

In Fig.. 44, a modification of Fig. 43 is illustrated. Here the retainer is formed with a looped end which hangs loosely on a pin with a retaining head. The lower ends of the retainer slide in a slot in one of the held members. The engaging pin is shaped similarly to the arrangement in Fig. 42, or can be machined with an acorn point. This pin engages the loop at the central part of the retainer. The advantage of the latter method is greater circular contact than only tangential contact with the straight-legged retainer. In both instances, only a slight pressure or pull is required to engage or disengage the pin.

Another form of wire fastener, shown purposely enlarged, is illustrated in Fig. 45. It is used where it is necessary to centralize the retainer in the held member. The engaged portion of the held piece rests in the loop at A. The

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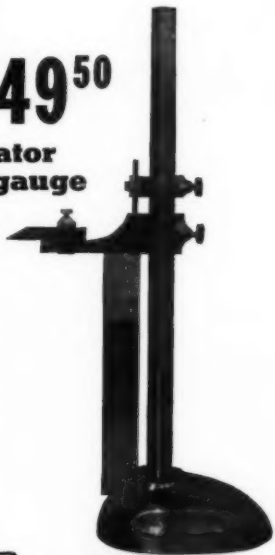

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1-4	3 3-4	1.20	1 1-16	7 1-4	3.40	1 7-8	10 1-2	8.00
5-16	4	1.30	1 1-8	7 1-2	3.40	1 15-16	10 3-4	9.00
3-8	4 1-4	1.40	1 3-16	7 3-4	4.00	2	11	9.00
7-16	4 1-2	1.50	1 1-4	8	4.00	2 1-8	11 1-2	10 00
1-2	5	1.60	1 5-16	8 1-4	4.80	2 1-4	12	11.00
9-16	5 1-4	1.80	1 3-8	8 1-2	4.80	2 3-8	12	12.00
5-8	5 1-2	1.80	1 7-16	8 3-4	5.60	2 1-2	12 1-2	13 00
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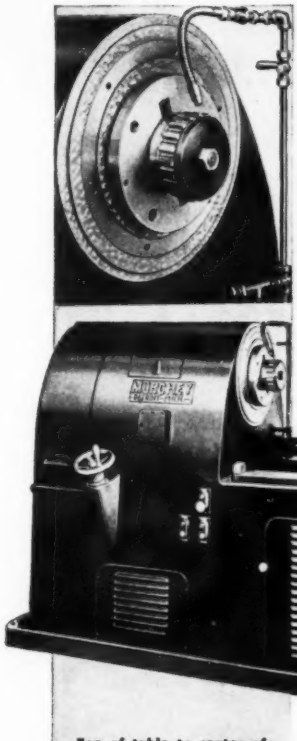

Milling hob is revolved eccentrically about work in which thread is to be cut, and simultaneously rotated on its own axis until cutting teeth of milling hob are advanced into work on a sufficient distance to produce full depth of thread. Cutter then continues rotating on its own axis continuing around work and simultaneously advanced by means of a lead screw for a sufficient distance to produce desired helical thread.

Top of table to center of spindle — 13½". Eccentric motion of spindle — 0" to ¾". R.P.M. of cutter spindle — 33 to 645 R.P.M. Spindle motor—5 to 7½ H.P., 1800 R.P.M. Feed motor—2 H.P., 1200 R.P.M. Table size — 21" width x 30" length. Spindle adaptor — 10¾" flanged adaptor with two driving keys and 50 milling machine taper. Spindle makes maximum of 1.2 revolutions during cycle. Standard equipment: motors, motor controls, hydraulic controlling guards, chip pan and wrenches.

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entering end is flattened or pointed to facilitate assembling.

Aluminum, stainless steel or chromium plated molding is attached to metal with wire clips as illustrated in Fig. 46. The metal to which the molding is fastened, is drilled or punched. The clips are snapped into the molding and slid along until they are positioned correctly. They are then pressed through the holes in the metal, contracting as they are assembled and expanding only enough to hug the sides of the holes. In this way the clips are still under tension, exerting pressure outwards, thereby keeping the molding firmly in place.

The U-shaped wire clip in Fig. 47 is so formed that when it is assembled, the ends exert pressure inwards. In this way, two pieces can be held together. The ends of the wire are turned outwards slightly to make assembly easier. The whole clip rests in the three slots, thereby presenting a flush appearance when assembled.

Sometimes a sleeve must be held in a housing with no visible means of retention, especially when axial movement is necessary. As shown in Fig. 48, a slot is milled in the bushing and a hole drilled at the bottom of this slot. A formed wire hook is pressed into the hole and staked or brazed. A groove is turned in the bore of the housing to accommodate the hooked end of the retainer. Either at assembly or disassembly, the retainer can be cammed out of the groove if the sides of the hump are between 90 deg. and 120 deg. included angle. The length of wire between the hump and the bottom of the slot should be sufficient to allow proper bending without setting.

Cast iron covers or doors can be held in place by a wire lock of the type illustrated in Fig. 49. The retainer is looped with a large curve at the engaging end to give sufficient springing action. The lower end is formed with a smaller loop, the distance between the two legs being enough to accommodate a headed screw used for adjustment and clamping of the retainer. Two pins or integral lugs in the door, position the retainer properly. The opening is edged

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See Page 353

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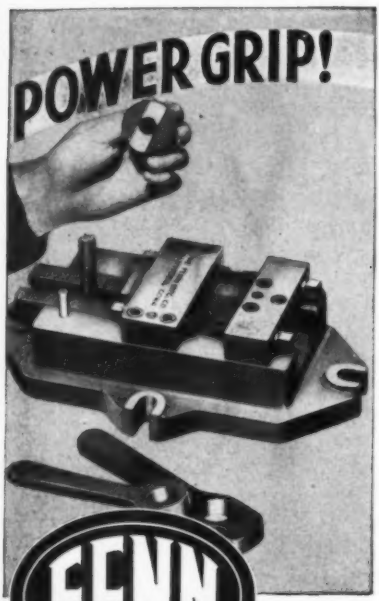

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with a two angled surface, the entering angle being about 30 deg. and the inside angle about 45 deg. As the door is pressed into place, the spring retainer is displaced to the distance of A as it slides under the apex of the two angular surfaces. As it climbs the 45 deg. angle, the cover is positioned while the large loop of the spring is still under tension. Because the retainer is inside, there are no visible means of fastening from without the assembly.

It is enlightening to consider the many shapes and forms into which wire can be bent to serve the mechanical need of mankind. For instance, a chain manufacturer uses a simple U-shaped locking pin to retain the side plates on chains, instead of cotter pins. One piece of formed wire takes the place of two cotter pins. Twisting one leg of the U out of parallel with the other so that it does not lie flat if placed on a flat surface is said to prevent the pin from shaking loose when assembled. In fact, the twist exerts enough tension when the clip is slid into the two engaging holes without further bending, to guard against loss of the side plates and consequent breakage of the chain. Application has been made for a patent.

Probably no better summary of this series of articles could be given than to quote a manufacturer, although not verbatim, giving timely advice for design, assembling and disassembling, storage and care:

1—Correctly designed and properly assembled retainer rings will not snap out of their accommodating grooved seats under the most severe operating conditions.

2—The rings must be elastic enough to snap back into the groove, even after numerous applications.

3—Care should be taken during design to assure easy assembling and not permit axial movement of the shaft.

4—They must be so made as to permit easy handling in the field, whether being assembled or disassembled.

5—Because over-stressing during assembling will cause the ring to take a permanent set, thereby becoming useless for the purpose for which it was intended, tools with stop limits should be used. Such tools or tapered fixtures should not exceed by more than a few thousandths of an inch, the shaft diameter over which the ring must expand, or

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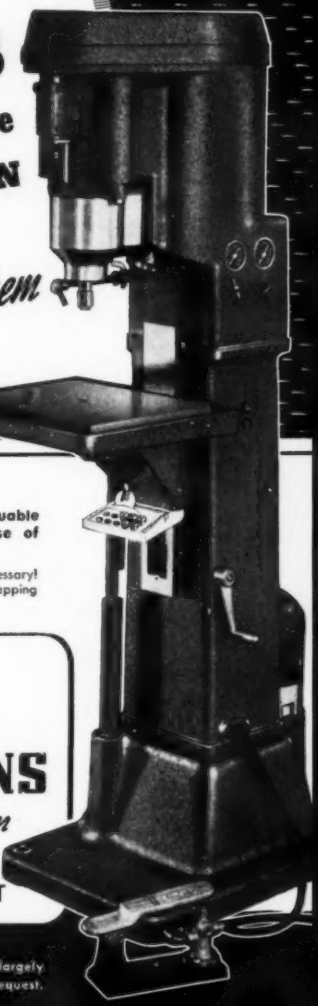

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the bore diameter into which the ring must contract.

6—Maximum stress (tension for external rings and compression for internal type rings) varies with the type of material, heat treatment, size of wire, radius of ring, amount of cold-working and factor of safety desired.

7—For practical working stresses, a range of from 175,000 to 225,000 pounds per square inch can be used.

8—Snap rings can be made of music wire, oil-tempered spring wire and soft spring wire, the latter formed by heating, then quenched and tempered. Stainless steel and brass, with correspondingly smaller stress values can be used.

9—It is better to let the spring ring manufacturer specify the Rockwell hardness because of the wealth of experience he possesses. This will avert brittleness, thereby acquiring a high degree of ductility and reactive value or "backbone."

10—Because all rings take a slight set after the first expansion or contraction, they should be designed to hold this to a minimum.

11—When the rings are to be stored by the user, they should be placed in a clean, dry place where there will be no sudden variations of temperature which might cause the rings to sweat and become rusty. Clean, dry hands and tools should be used.

12—It is important that the snap rings should not be twisted out of shape. The corners or edges of the rings and grooves should not be marred. The outside diameter or periphery of the rings should not be hammered or tapped. The rings should not be expanded or contracted more than necessary, but sufficient clearance should be maintained between ring and shaft to permit easy assembling.

With the thought in mind that some designers and manufacturers of war equipment may require additional information relative to designing formulas, standard stock sizes, shapes and materials available, the names of several makers of retaining and snap rings are given. They are: Eaton Mfg. Co., Massillon, Ohio; Barnes-Gibson-Raymond, Division of Associated Spring Corp., Detroit, Mich., and The National Lock Washer Co., Newark, N. J.

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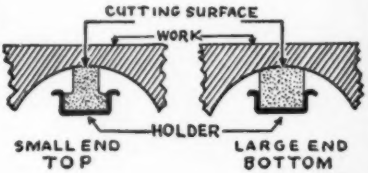

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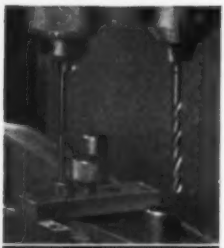

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The photographs in the panel above show B-C Ground-from-Solid Reamers in operation and the finished parts. • The upper views show an aircraft part of nitralloy steel requiring a .2508"/.2510" hole with fine finish. • The lower views show a textile machinery part requiring holes .1880"/.1883" in cast iron.

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Centralized Tool Grinding

By M. E. Knoll*

ALTHO most larger plants are sufficiently well acquainted with the advantages of centralized grinding of cutting tools to have set up such departments, it is surprising to note in many plants that tools are still being ground by machine tool operators themselves with consequent loss of productive time.

In the past this has applied in somewhat lesser degree, perhaps to plants using carbide cutting tools than to those still largely using steel tools.

When carbide tools are introduced into a plant, it is desirable to establish simultaneously a centralized grinding setup if it does not already exist. "Centralized grinding," it should be pointed out, does not necessarily mean a single grinding room for an entire plant. There may be several such departments, depending on the plant layout and trucking distance to and from machines.

Outstanding of the many advantages of centralized grinding is the reduced "down time" on productive machines.

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Precision made in 15 standard sizes, or to customers specifications. Write, wire for detail data.
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Then the machine operator can devote his entire time to keeping production going, instead of taking time out to grind tools with the machine stopped. As a result, the improved tool sharpening obtained with centralized grinding usually effects a material reduction in the frequency of shut-downs required for tool changes.

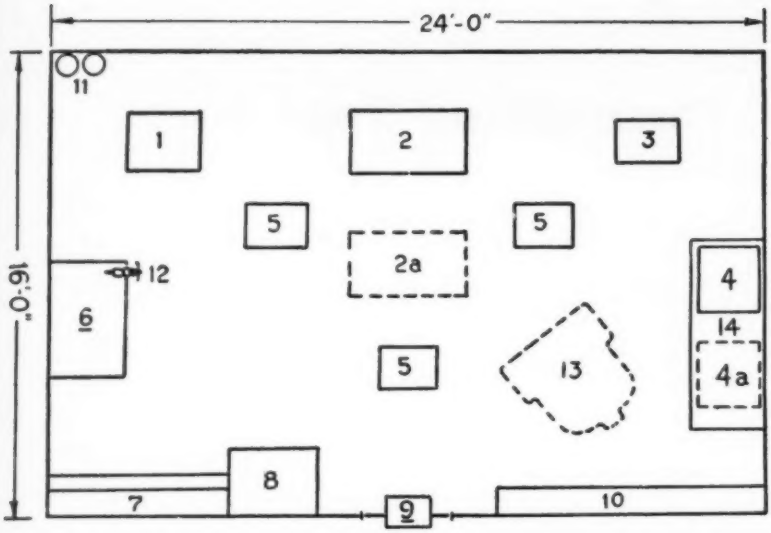
Although shut downs for tool changes are less frequent with carbide tools than with steel tools, the advantages to be derived from centralized grinding are even more pronounced, as may be seen from this comparison of the two methods of handling tool grinding.

Lower Cost

An important advantage of centralized grinding is the reduction in cost achieved. In the first place, centralized grinding requires less equipment than where such equipment is distributed throughout the plant. Experience indicates that there is usually a minimum of idle time for such equipment, as the time can be budgeted in maintaining the required supply of re-ground tools ready for use.

In centralized grinding rooms, furthermore, plants can usually afford to have one or two bigger and faster machines for hogging off front and side relief (clearance) of steel shanks. One or two such machines are usually sufficient to hog off all the steel shanks. This is particularly important in grinding carbide tools for which special grinders equipped with special wheels are desirable to grind the tips properly. Such grinders are not so efficient

*Detroit District Manager, Carboloy Co., Inc.



Typical tool grinding room layout showing basic equipment recommended for grinding single point carbide tools with suggested provision for future expansion: (1) Pedestal Grinder equipped with wheels for grinding steel (at least 10" wheel—preferably larger). (2) 10" or 14" Pedestal Grinder equipped with wheels for grinding carbide. (2a) Future Duplicate of 2. (3) 6" Pedestal Grinder equipped with diamond wheels. (4) Chip Breaker Grinder (if tools used extensively for cutting steel). (4a) Future Chip Breaker Grinder. (5) Tool Table on Casters. (6) Bench 30" x 48". (7) Stock Bins—Lower section 18" x 6'0"; Upper section 12" x 6'0". (8) Shop Desk. (9) Wicket in door. (10) Stock Bins—12" x 9'0". (11) Gas Tanks for Brazing. (12) Vise. (13) Future Tool and Cutter Grinder. (14) Bench 30" x 6'6".

when used to grind the shanks of the tools.

In localized grinding on the other hand, the tendency is to use a multiplicity of smaller machines with small wheels and individual dust collectors on account of their lower individual cost, thereby increasing grinding time and cost. In centralized grinding, a single larger and efficient dust collector installation generally suffices for the entire department. This provides more healthful conditions for the operators and longer life for the grinding machines due to reduced abrasive accumulation.

Also contributing to lower operating cost is the reduced inventory usually required when grinding is centralized. This reduction applies not only to wheels, etc., but also to tools themselves, particularly where "standard" carbide tools are used. Such standard tools may be re-ground as returned, permitting the maintenance of a small floating bank of tools ready for use. This usually is reflected in a smaller number of tools in circulation in the plant, especially where several operations have to be performed on one machine. Where templates are used for grinding tools, centralized grinding usually enables a considerable reduction in the number of templates required to sharpen the tools in the plant.

Better Tools

Contributing more than may be appreciated to a reduction in tool cost in

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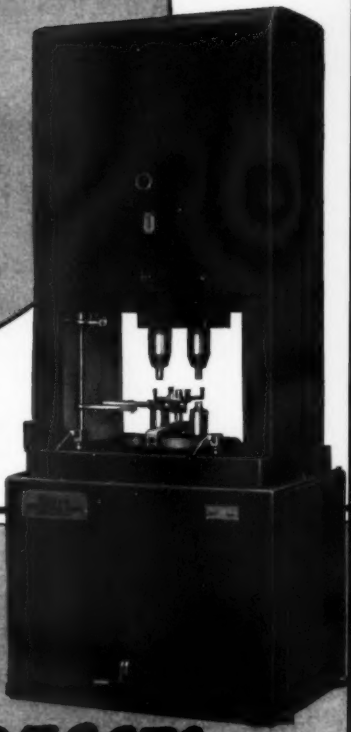

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centralizing tool grinding are such factors as reduction in supervisory costs, tool spoilage and grinding time, as well as the greater grinding proficiency achieved.

With localized grinding of tools, supervision by competent men is fairly costly, while supervision of grinding by foremen or gang-bosses requires intensive training for a considerable number of individuals. With centralized grinding, supervision is simplified and the number of men required to assure a good job is vastly reduced. This is aided by the fact that men who specialize in grinding tools in a central department are usually vastly more interested in their jobs than the machine operators would be. In addition, each grinder has a responsibility, not only to his supervision but also to the machine operator who will be using the tools he grinds.

That men who grind tools practically all the time will attain a higher proficiency in the art is rather obvious. This results in reduced tool spoilage and assurance of maximum performance of the tools on the machines, particularly with carbide tools. While best grinding procedures for the latter are quite simple, they do differ materially from grinding steel tools. Improper grinding has spoiled many a carbide tool.

Another characteristic noted among workers in centralized grinding rooms is exchange of ideas on short-cuts or improved or simplified methods of grinding. As a result of this, as well as previously mentioned factors, grinding time—when centralized—is considerably less per tool than when handled by individual operators. The time of the latter individual is saved, also for productive operations.

In setting up centralized grinding it is usually well, also to set up centralized tool control. This enables the setting of a time limit for complicated or expensive tools in continuous operation. It is usually found less costly, particularly with carbides, to sharpen such tools every so often, and keep them in condition, rather than to wait until grinding is absolutely necessary. This insures the tools against damage when used in too dull a condition and also assures maximum machining efficiency.

However, the greatest gain from centralized grinding is with the much-neglected single-point tools, and the number of these used in average plants quickly multiplies the individual savings.

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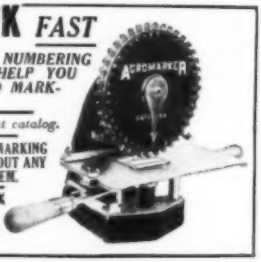

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This grinder located in a tool crib of a large aircraft engine plant is used for emergency sharpening and "touch-up" jobs.

Maintenance of tools in proper working condition multiplies their life many times. Even those which have become badly worn, rusted or chipped — that seem to have outlived their usefulness — may often be salvaged to give valuable additional service.

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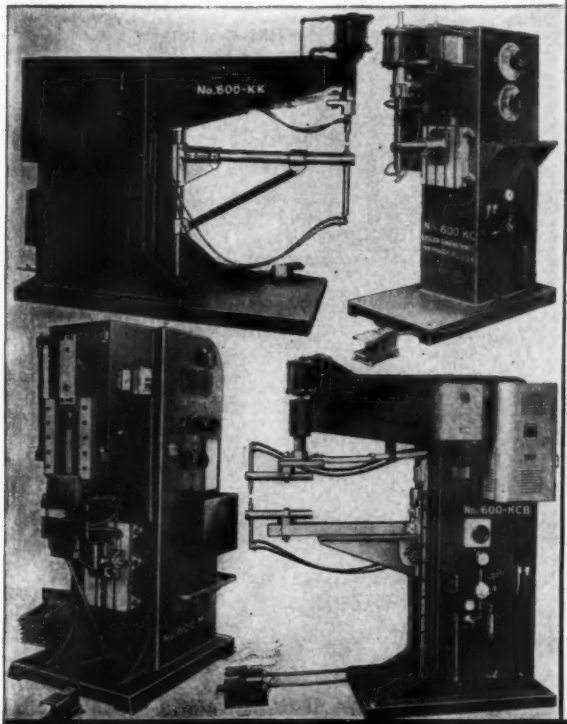

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TRADE MARK

Women and War Production

WOMEN employees of Westinghouse Electric & Mfg. Co., are now getting a chance to do a man-sized job on the war production line. Classes have been organized at the big East Pittsburgh, Pa., plant to train women for work done exclusively by men since 1918. At the same time, under the "earn-learn" program, the women are given actual shop experience under the guidance of specially-trained mechanics.

For four hours a week, the women get classroom instruction on machine tools. Then for the remainder of the work-week, they put into practice their newly-acquired knowledge. In class, they get instruction in machine shop analysis, related mathematics, blueprint reading and safety precautions. They are paid for both classroom and shop work.

"The employment of women for men's jobs was dictated by war production demands, coupled with the large number of men entering the armed forces," explained A. C. Streamer, Vice President in charge of the East Pittsburgh Works, largest of Westinghouse's 25 principal manufacturing locations.

Replacements in the machine tool ranks also are made by upgrading men and women employees in the lower wage brackets, placing them in more important jobs as they demonstrate fitness. Notices of available positions are posted throughout the plant and women already employed are given first chance at the new work. If the positions remain unfilled after three days, women are hired from a list of outside applicants.

Raymond Carosso, instructor in machining and production methods, is shown explaining the reasons for, and methods of machining a casting. (Westinghouse photo).

Women candidates are selected for the earn-learn program on the basis of interviews and oral and written examinations to determine aptitude, temperament and mechanical manipulation ability. Those who qualify for the machine tool positions earn the wage established for men on jobs ordinarily filled by men. In some other Westinghouse plants, women already have taken over important war production jobs.

At one Westinghouse-operated naval ordance plant, white-haired Mrs. Grace Augustus works on a projectile inspection line because—"I wanted to do my part to help production for the war." She lost one son at Pearl Harbor and has another serving on a submarine. Mrs. Augustus left a job as a cafeteria manager to take a shop job as her contribution toward winning the war. She buys a War Savings Bond each week and says she is "crazy about the work and expects to stay until the war is over."

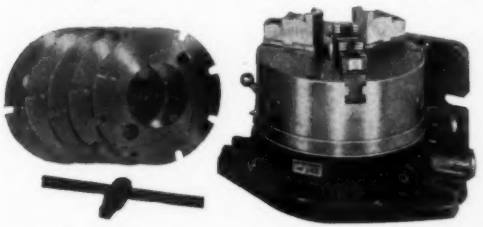
Mrs. Grace Augustus, a cafeteria manager for 13 years, took a shop job with Westinghouse because it seemed the best contribution she could make to winning the war. She is shown inspecting 40 mm projectiles. She lost one son at Pearl Harbor and another is serving on a submarine in the Pacific.

Mary Adams was one of the first group of women hired by Westinghouse to do the work previously handled exclusively by men. Her husband is in the army in Africa and she makes parts for electrical equipment on a turret lathe.

Pauline Katich is one of a group of women trained to step into machine tool jobs. She receives four hours weekly of classroom instruction and spends the remainder of the work week on the war production line in the shop.

Hartford

SUPER SPACER



The Super Spacer, with its attachments and fixtures has proven to be a tool of exceptional value for the rigid control of accurate machining operations. It is adaptable for milling, drilling, grinding, jig boring and slotting, at feeds and speeds limited only by the capacity of the holding means and the power of the machine.

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These girls, employed at a Westinghouse Naval Ordnance Plant, are giving the final inspection to 40 mm projectiles. Part of the Women's Army of Production, they are: (l. to r.) Ulgean Stockton, Cecelia Ann Logsdon and Marcella Birkelbach.

"I felt I could be helping out my husband, who is in the Marines, as well as myself," explained winsome Ann McCastland, former Miami, Fla., model who operates a machine which processes war equipment. Mary Adams, another machine tool trainee, is happy that she can back up her husband, an army private stationed abroad. She operates a turret lathe which makes parts for electrical equipment.

Women Workers No Great Problem

Miss Lucy Ogden Norton, Assistant Supervisor of Personnel at the Erie Works of the General Electric Co., recently outlined the problems which industry faces in replacing men with women.

Miss Norton said at the outset that, while there are certain problems to overcome, they are not insurmountable.

"I disagree with any industrial executive who feels that the introduction of women introduces some mysterious or evil element into the factory situation. Women have been in all situations since the beginning of time. I think **only Adam** got there first. A new woman employee is not very different from a new man employee and we actually have no momentous obstacles to overcome," Miss Norton stated.

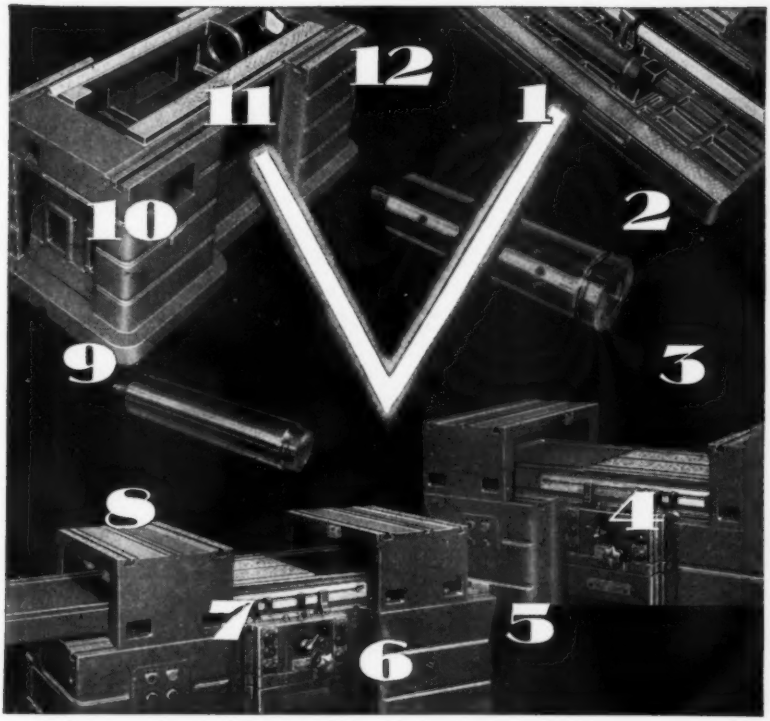
Pointing to the rising tide of women workers, Miss Norton said:

"There are now 14,300,000 women gainfully employed in the U.S. By the close of 1943, this will be well over 18,000,000. This may mean that more than 40% of the working population will be women, and this during the first two years of the war. This is a tremendous increase since the percentage of women in most industries prior to the war was below 19% and in some industries almost nil."

As Miss Norton outlined them, the six problems with which industry must concern itself if women are to take the place of men are:

"1—First, we must establish a fair rate of pay for a woman performing a man's job. There has been much publicity given "equal pay for equal work." If a woman is required to do the same work as a man, operate the same machines which men operate, and if this work will again be done by men after the war, then this is considered "Man's work" and the woman should receive the same rate of pay as a man.

"2—Secondly, we must determine the types of work on which we can successfully employ women. This must be done through a detailed survey by



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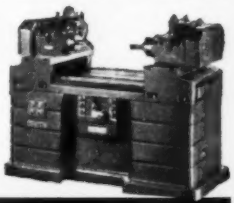
Below: **No. 215-A—one of nine different styles of Ex-Cell-O Precision Boring Machines . . . for boring, turning, facing.**



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Catherine Ridel is shown milling the teeth of a milling machine cutter. Note that she wears safety glasses and a safety hair net. She spends four hours weekly in the classroom studying blueprint reading, machine shop analysis and mathematics.

trained engineers, personnel counsellors, wage payment technicians and safety consultants.

"3—Thirdly, we must establish a satisfactory schedule of working hours. In most cases this will be determined by state law. In December, 1941, most states relaxed their regulations concerning women to some degree. It is generally believed that a 6-day, 48-hour week is best. Pennsylvania relaxed its Woman's Law from a 44-hour limit to this 48-hour, 6-day basis soon after Pearl Harbor. Also, women may work on all shifts around the clock.

"4—Fourth, we must set up good health and safety standards for women. Here, the setting up of good, sanitary restroom facilities and cafeteria service are of great importance. Safety regulations with reference to women's clothing are essential and the standardization of uniforms appears in the offing although it is always difficult to dictate style to the fairer sex.

"5—Fifth, we must develop a simplified training program for women. The statement that 'women have no mechanical ability' would be more correct if worded 'women have no mechanical familiarity'. In the past, most mechanical training has been closed to us.

"6—Finally, we must look to the community for adequate care of dependent children of employed mothers. There is definite need for this care already in the case of mothers working on the second and third shifts. The answer to this general problem will probably be local nurseries run by the city or separate nurseries set up by individual plants."

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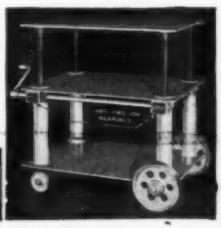

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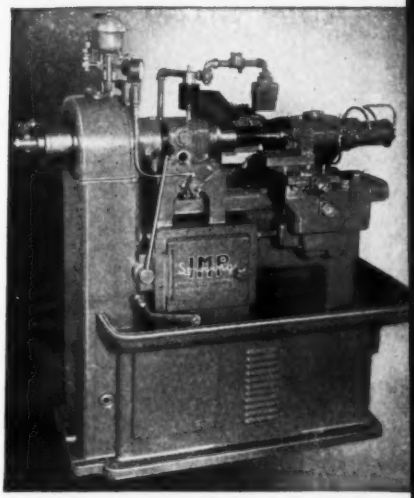
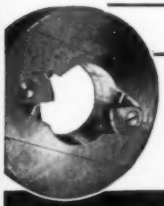


The IMP is intended primarily to handle work demanding high speeds (up to 5000 R.P.M.) and extreme accuracy, but its sturdy, compact design makes it likewise suitable for turning heavier work such as small pistons, bushings, gear blanks, etc. It incorporates such modern features as: Seneca Falls built-in Change-Over Mechanism; positive operation of Third Slide and Back Attachment by self-contained drum cam; anti-friction bearings, and automatic lubrication to all bearings including carriage ways.

An extremely long bearing on the carriage is obtained through the unique head and tailstock design which permits the carriage slide to pass under them. The carriage is mounted on a Flat and a V-way. Longitudinal movements are obtained by a drum cam. Feeds from .091" to .054" per revolution are obtained through 4 feed ranges and by means of pick-off gears—fine feeds being desirable for diamond turning. Two types of heads are available depending upon spindle speed required. A geared head is used for lower speeds and direct drive for higher ranges.

The Lo-swing Imp, because of its integral unit design, lends itself to practically unlimited tooling possibilities. A Third Slide or Over-arm for additional facing, grooving or chamfering operations — either roughing or finishing—can be furnished. Automatic work handling devices are frequently used with this machine.



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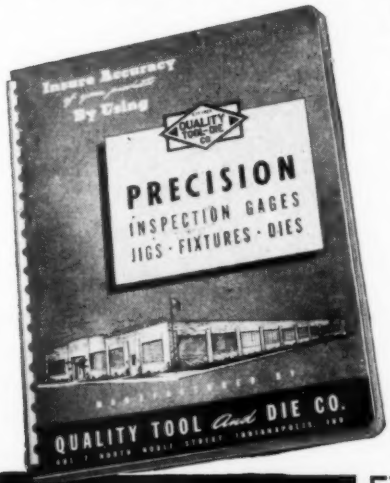

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NO LONGER can micrometers be obtained immediately, to replace those that have become damaged or worn to such a degree that their accuracy isn't wholly dependable. The tremendous demands of the war production program, particularly in the past year, have greatly extended the delivery dates that micrometer manufacturers are able to give. Already these manufacturers have increased their working schedules and concentrated production on a limited number of models and sizes. Still—the backlog of orders continues. Every micrometer in use, that can be **kept** in use, helps to place the limited supply more quickly at work in essential industries. Keeping your micrometer in service means constantly handling it **with unusual care** so that it will not become damaged—it means constantly bearing in mind such simple suggestions as these:

Do not measure work that is revolving.

Do not turn the spindle forcibly so as to jam work against the anvil. This may force the measuring surfaces out of line and even spring the frame.

Do not twirl the micrometer to open it.

Do not carry the micrometer in a pocket containing dirt or grit.

Do not expose the micrometer to a flood of coolant—particularly coolant containing dirt or emery.

Do not lock the micrometer at a particular setting for use as a caliper gage for long periods—such use may cause excessive wear of the relatively small measuring surfaces.

Use extreme care in measuring cutting edges of tools such as drills and reamers unless the micrometer has special measuring surfaces for the purpose.

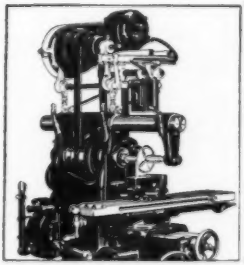
Keep the measuring surfaces apart when the micrometer is put away, to avoid any chance of moisture between the surfaces causing rusting.

Protect the micrometer when not in use by keeping it in its box.

Follow carefully the instructions of the manufacturer on lubricating the micrometer, and particularly on adjustments.

Safe Drilling

Twelve regulations for safe operation of drill presses are contained in a small pamphlet prepared for distribution by foremen to drill-press operators at



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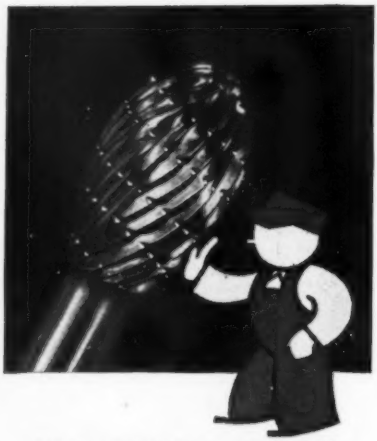

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General Electric's Schenectady Works. One of the regulations, aimed specifically at the elimination of one of the most common of industrial accidents among the fair sex, warns girls that "Hair nets, snoods, or caps must be worn so that the hair will not catch in spindles or revolving tools."

Front of the pamphlet carries the admonition:—"If you don't know the safe way, stop and find out. It's a lot easier to do things right than wrong—and a whole lot safer." The 12 regulations, approved by the Works' Safety Committee, are:—

Before Starting Drill Press

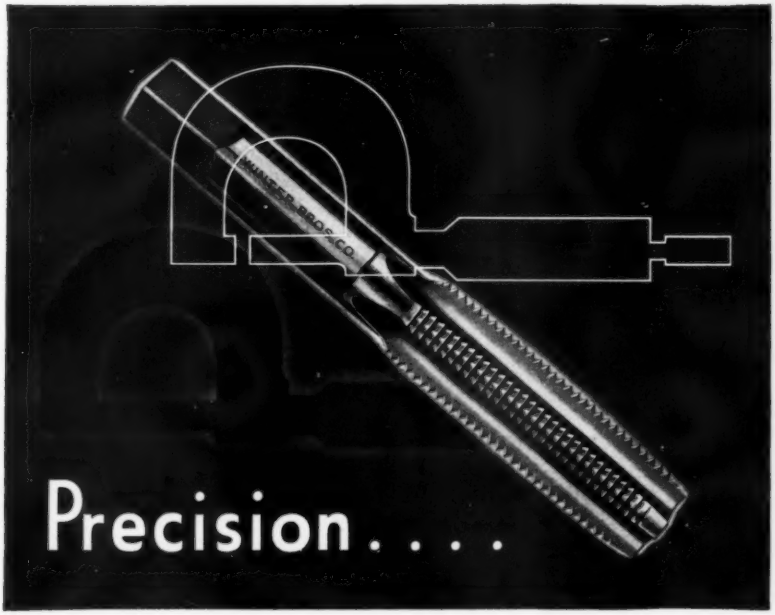
1—If there are red, green or yellow tags on machine, do not move control handle or switch.
2—Use the method prescribed by your foreman when lifting jig or work to bedplate.
3—Work should be blocked or clamped securely before starting to drill.
4—Remove all drift pins and chuck wrenches before starting spindles.
5—Goggles and safety shoes should be worn to protect against flying chips (eye hazards) and material falling from bedplates (toe hazards).
6—Drill-press operators should not wear finger rings, loose sleeves, neckties, gloves, or wrist watches. Hair nets, snoods, or caps must be worn so that the hair will not catch in spindles or revolving tools.
7—Use proper feeds and speeds.
8—Before attempting to replace a driving belt, be sure motor is shut off.

While Press Is In Motion

9—Keep drill lubricated. If drill should burn, it might break.
10—If drill sticks in work, do not attempt to start drill with hand while motor is still running. Shut off motor first.
11—Do not use compressed air unless specifically instructed by foreman. Use a hook, brush, or special tool to remove chips.

Before Leaving Machine

12—Be sure the machine is SHUT OFF before leaving it.



Winter taps are precision-made to produce accurately threaded parts for quick assembly—handle them with care! They will take plenty of punishment on the job; but no tap will stand being thrown down on a bench, or into a box with other tools, without chipping off teeth or dulling the cutting edges.

Use taps as you would a micrometer—with reasonably gentle care, that their usefulness be prolonged to the limit.

A Division of

THE NATIONAL TWIST DRILL & TOOL CO.

Detroit, Mich.

Winter Brothers

COMPANY

Wrentham, Massachusetts, U. S. A.

ONLY 80 SQUARE INCHES BENCH SPACE . . . . BUT

HOW IT HEADS RIVETS!

A compact, rugged little machine that roller-spins a head on rivets

At High Speeds . with No Noise

Bench and floor models, capacity 3/16" to ⅝" rivet, silently turn them out at rates up to one per second, with smooth, polished heads.

LINLEY ROTARY RIVET SPINNING MACHINES

are the profitable answer to many small riveting operations where rivet heads must be uniform in size and tightness.

Radial thrust bearing carries both the radial load and the riveting thrust load, a feature which greatly extends bearing life. Frames are sufficiently heavy to prevent machine spring.

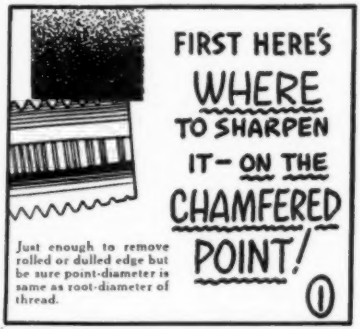
Write for bulletin to

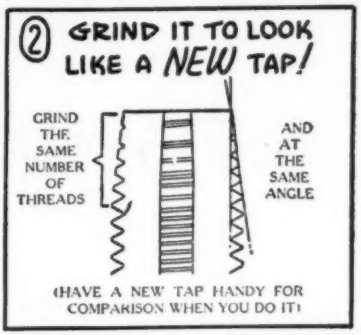
LINLEY BROS. CO.

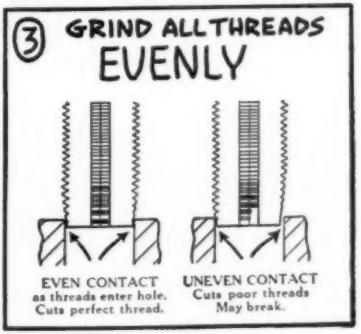
663 State St. Extension BRIDGEPORT, CONN.

How to Grind a Tap

This material is from the second folder in a series of educational mailing pieces issued by Greenfield Tap and Die Corp., Greenfield, Mass.




② GRIND IT TO LOOK LIKE A NEW TAP!
GRIND THE SAME NUMBER OF THREADS
AND AT THE SAME ANGLE
(HAVE A NEW TAP HANDY FOR COMPARISON WHEN YOU DO IT!



HOW WOULD YOU CUT THIS BAR?

What diameter wheel is best? What wheel thickness is best?
How many cuts from one wheel? How fast should you feed?

You will find the answers to those and hundreds of other questions vital to production abrasive cutting in the Andrew C. Campbell Division's

NEW, FREE, ILLUSTRATED BOOKLET

Abrasive Cutting

This booklet gives you data you can use with profit right now if you are production cutting steel, brass, bronze, ceramics, plastics, or glass, etc.—tubing, solid bars, or flat.

It gives you the voice of experience of the entire industry on such things as dry and wet cutting, types and methods of using coolants, selection of wheels, control of speed for best production, etc., etc.

WRITE FOR FREE COPY

All you need do is write for a copy on your company letterhead, saying what material you are cutting.

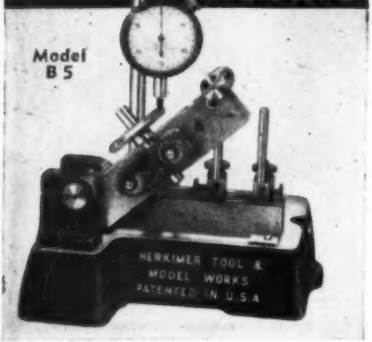
Campbell ABRASIVE CUTTING MACHINES

ANDREW C. CAMPBELL DIVISION

AMERICAN CHAIN & CABLE COMPANY, Inc.
BRIDGEPORT • CONNECTICUT

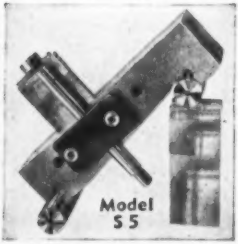
Simplified

BEVEL GEAR GAUGING



These gauges have an aligning seat which will receive alternately and align either a special apex defining setting-up bar or a mandrel on which the gear blank to be measured may be mounted.

The setting-up bar is used in conjunction with gauge blocks to define a plane passing through the apex of the gear cone of the bevel gear, as related to the thrust face of the gear hub. No difficult calculations or operations are required.



Write us for descriptive folder.

HERKIMER TOOL & MODEL WORKS

1010 George St. Herkimer, N. Y.

④ GET RIGHT RELIEF BEHIND CUTTING EDGE SO TAP WILL CUT FREELY

NOTE: Amount of relief varies for different materials. Check this before grinding.

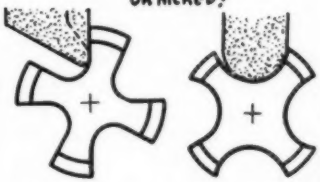
⑤ MAN vs. MACHINE

DON'T sharpen taps by hand if you can by machine. But if you do have to, use a soft 80-grain wheel and have a new tap handy for comparison.

USE a good tap chamfer grinding machine, if possible.

Take Light Cuts to avoid "burning" the cutting edges of tap.

⑥ GRIND THE FLUTES ONLY IF EDGES OF UNCHAMFERED TEETH ARE DULLED OR NICKED!



Use a SAUCER WHEEL if cutting face is STRAIGHT

Use a FORMED WHEEL if cutting face is HOOKED

USE HARD 60 GRAIN WHEEL

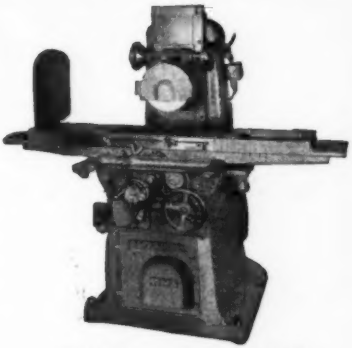
WARNING: Avoid grinding flutes of taps with radial relief if possible because grinding away cutting edges causes tap to cut undersize holes.

ABRASIVE No. M3 SURFACE GRINDER

MOTORIZED SPINDLE

For Full Power and Precision

The Abrasive No. M3 combines the motorized spindle so successfully employed on the No. 1½ hand operated grinder with the full automatic feeds of the popular No. 3B. The resulting machine is proving highly satisfactory on many types of work and many customers have reordered.



FAST • ACCURATE • CAREFULLY ENGINEERED

The dynamically balanced rotor is mounted directly on the wheel spindle . . . of ball or plain bearing type . . . and delivers full motor power to the wheel without vibration. Belts, chains and sprockets are eliminated. A separate ½ h.p. motor in base of machine drives longitudinal and transverse feeds.

For Better Delivery Order the M3

Owing to the fact that the M3 Surface Grinder has only recently been made generally available, deliveries are today months in advance of the 3B.

ABRASIVE MACHINE TOOL COMPANY

Dealers in Principal Cities

EAST PROVIDENCE . . . RHODE ISLAND

W-S Standard Reamers with carbide tips. Tapered shank (illustrated) and straight shank types. Sizes ¼ to 1½.

20% PRICE REDUCTION

ON W-S STANDARD REAMERS

EFFECTIVE APRIL 1, prices on W-S Standard Reamers come down 20%! These new, lower prices are the direct result of our greatly increased volume on reamers and new production facilities. ...The majority of W-S reamer sizes is in stock most of the time. In addition, we keep numerous semi-finished shanks on hand for grinding to in-between sizes. Each W-S tool is genuine CARBOLOY tipped. (*Other brands may be specified.*)... Carbide tipped tools are not just a specialty with us...we make them *exclusively.* You can *expect* and *get* uniform, high quality results with W-S tools. WENDT-SONIS COMPANY, HANNIBAL, MO.

Write for FREE Catalog 942 and LATEST PRICES!

WENDT SONIS

CARBOLOY CUTTING TOOLS

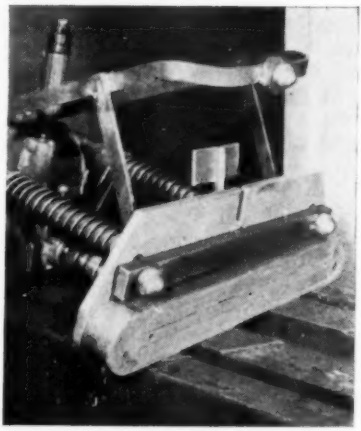
CENTERS • DRILLS • CORE DRILLS • COUNTERBORES • SPOT FACERS • END MILLS • REAMERS HOLLOW MILLS • LATHE BITS • SPECIAL TOOLS

P.S. REMOVE BROKEN TEETH in taps by grinding or they will damage tapped hole.

YOU CAN SAVE BROKEN TAPS by cutting off damaged end with abrasive cut-off wheel and then grinding a new chamfer.

SHARPEN AT FIRST SIGN OF DULLNESS. ON PRODUCTION JOBS, SHARPEN EVERY SO MANY HOLES.

Drill With Magnetic Base



A portable drill with an electromagnetic base, developed to speed the job of drilling and tapping holes in larger water-wheel generator frames and similar equipment in manufacture at General Electric's Schenectady Works can also be used for counterboring and countersinking.

Holes in the generator frame, a 1¾-inch casting, are drilled and tapped at an angle, using the holes already drilled in 3/16-inch cover plates for templates. One man can set up and perform the operation easily.

The tool is simple to make. It consists of a railbonding drill frame altered to make a reversible multivane drill. A third leg added to the frame provides stability. The drill is fitted

Happy Workers are Seldom Absent

When workers enjoy their jobs they just simply don't want to be absent. And every good American enjoys his work if he understands it and can do it well. But today so many men and women who wish to give their best in the war effort are assigned tasks for which they are totally unskilled, with the result that they are unhappy.

◆ Management, in the stress of quickly getting into production, has sometimes ignored the good planning and proper tooling which would permit the use of unskilled labor with the least aggravation. In some instances the nuisance value of poor tooling has caused a turn-over in labor and an amount of absenteeism that rightly should not be chargeable to labor at all, but is primarily a management problem.

◆ La Salle engineers have worked with many great American companies in their wartime planning and tooling, in the development of fixtures that minimize the possibility of errors and that take the skill element out of the operation. In reducing tool aggravation, the worker becomes more satisfied with his job and is much less likely to absent himself from it.

◆ Perhaps your plant has a problem in tool, fixture, and special machine design, or in plant layout. No matter what your production need, La Salle will be glad to discuss it with you at no cost. Just write, wire, or phone us today.

LA SALLE DESIGNING CO., 628 W. Lake St., Chicago, Ill.

AL J. CONN, MANAGING DIRECTOR

LA SALLE

PRODUCTION AND MANAGEMENT ENGINEERING

with a taper socket and a quick-change chuck to speed the changeover from drill to tap, since, once the drill is positioned, the hole is drilled and tapped without disturbing setup. The drill is ratchet fed.

The electro-magnet used will exert a force of about 500 pounds on material with a minimum thickness of 3/16-inch, and equal force on material of greater thicknesses. An air gap of 10 mils between the poles of the face plate and the cover plate compensates for irregularities on the cover plate surface. The magnet operates on 120 volts and is energized and de-energized by means of a toggle switch conveniently located on the frame. A foot-lever is used to lower magnet to the work and to raise it for repositioning drill. When magnet is in the raised position, the three-legged frame can be moved about easily on its ball casters.

A solenoid-operated air valve between air source and drill keeps it inoperative unless magnet is energized. Thus, if power on the drill is lost, the chance of possible damage to tool or operator is eliminated. The valve is wired in parallel with switch and on the magnet, or load side, and is normally closed.

Motor Preparedness

By Frank V. Faulhaber

In these days of hectic war production, it assuredly behooves machine shop management to be prepared as adequately as possible, with equipment and supplies to maintain uninterrupted production. Replacement machinery, parts and materials, suddenly needed, may be unobtainable at short notice. This applies even to the smaller plants. Even when substitute electric motors are provided, these are not always taken care of properly. Delicate piece of equipment that it really is, an electric motor is capable of marvelous service, yet maximum possibilities cannot be expected when efficient care and maintenance are lacking.

In some machine shops, spare motors are relegated to places difficult of access. Perhaps it is supposed they will be out of the way. Often it is a trial to find and haul out such motors, with the attendant waste of time and ef-

BURR KEYSEATERS

Mill keyways in the run or on the ends of shafting already erected—save money on alteration, erection, and repair work.

Made in 4 sizes, for hand or motor operation.

Write for Bulletins and prices.

JOHN T. BURR & SON
429 Kent Ave., Brooklyn, N. Y.

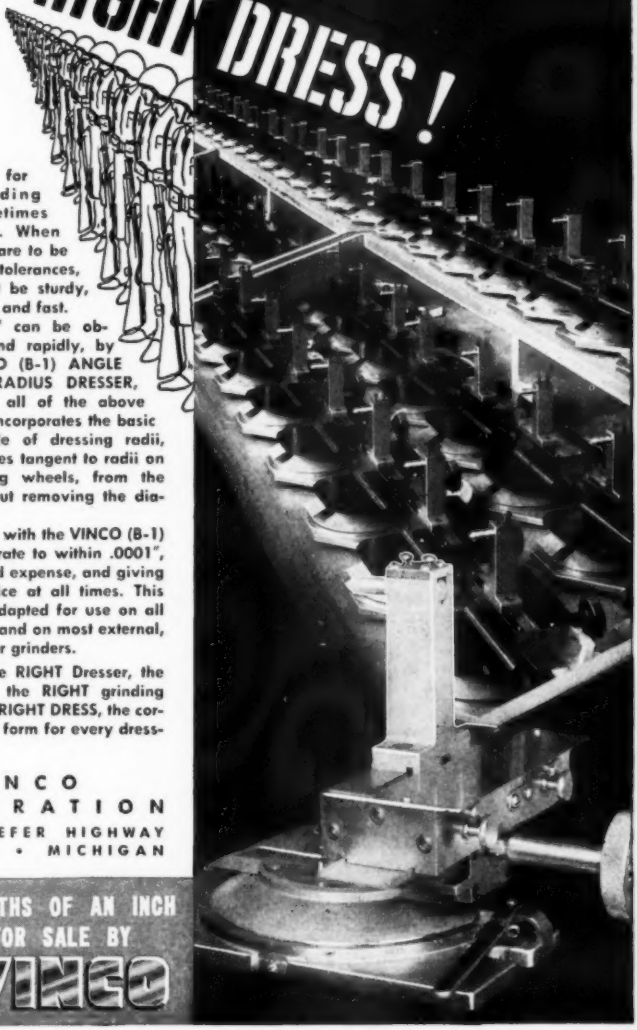
For Machine and Tool Work & Quick Set-Ups

The only 3-way reading precision indicator. Accurate in either direction. Feeler mounted in centered cone bearings. .014 reading. Priority rating required.

Price $5.00 plus postage *Write for folder.*

J. R. Reich Manufacturing Co.
45 E. Stroop Rd., Dayton, Ohio

RIGHT DRESS!



RIGHT DRESS* for abrasive grinding wheels is sometimes hard to obtain. When grinding wheels are to be dressed to close tolerances, the dresser must be sturdy, flexible, accurate and fast.

RIGHT DRESS* can be obtained, easily and rapidly, by using the VINCO (B-1) ANGLE TANGENT TO RADIUS DRESSER, which combines all of the above requirements. It incorporates the basic patented principle of dressing radii, angles, and angles tangent to radii on abrasive grinding wheels, from the same axis without removing the diamond.

RIGHT DRESS*, with the VINCO (B-1) DRESSER is accurate to within .0001", reducing time and expense, and giving trouble-free service at all times. This dresser can be adapted for use on all surface grinders, and on most external, internal and cutter grinders.

* Remember, the RIGHT Dresser, the RIGHT operator, the RIGHT grinding wheel, mean the RIGHT DRESS, the correct and accurate form for every dressing operation.

VINCO
CORPORATION
8859 SCHAEFER HIGHWAY
DETROIT • • MICHIGAN

MILLIONTHS OF AN INCH
FOR SALE BY
VINCO

Always start truing at center of wheel face because the corners often are worn smaller.

Diamond holders and mechanical wheel dressers should be clamped securely to the table and well supported to eliminate vibration.

In precision grinding the better the truing the better the finish obtained.

(On the Grinding Line—Bulletin No. 23, published by Norton Co., Worcester, Mass.)

STUBBY'S BEEN GETTING FEED LINES THAT LOOK LIKE THE RIDGES ON A PHONOGRAPH RECORD
SAY, BOSS, THAT INSPECTOR HAS BEEN TURNING THUMBS DOWN ON MY WORK LATELY
THAT LOOKS LIKE POOR TRUING WHICH WILL ALWAYS GIVE YOU POOR FINISH ON YOUR WORK.

fort. Meanwhile production may be seriously retarded. The matter of proper storage is of vital import, so that a given motor can be found forthwith when wanted and set up without seriously disrupting production.

Pertinent records should be maintained on all motors, indicating such information as source, date of purchase, installation, repairs size, type, for what purpose, and other vital shop data. Thus the management will never be without accurate, complete information regarding the plant's motors.

The machine shop having in readiness at least one motor of each size, is indeed forehanded. Management, having had experience along this line, can best appraise the handicap under which a shop operates when having to compromise on a motor not exactly appropriate for the purpose. When production is hindered while motor repairs are made, the war effort suffers. It is better to have an exact substitute fit right into the slack, without fuss, dealy or disruption.

Spare motors should be stored in a dry place, never in a damp basement, or in rooms where extreme temperatures may impair the insulation. When a motor has been subjected to moisture unavoidably, the windings should be thoroly dried before starting it in service. If the size of the apparatus does not prevent, the windings can be baked dry in an oven. Infra-red dryers have also been used with success. Or, a current can be passed thru the windings. The temperature, preferably, should be increased gradually. When uncertain as to the serviceability of the equipment, and to forestall possible disappointments, the wiser procedure is to assign the job to a special expert.

Motor depreciation varies with the operating conditions, excessive dust, for instance, being a factor. More and more, modern electrical motors are solving machine shop problems. Irrespective of the type of motor, it should be stored in a clean, dust-free place. Excessive vibration, steam and oil vapors and corroding fumes, all have adverse affects. Even in suitable storage, a motor should have additional protection in the form of a covering, impervious to outside atmosphere and deleterious influences. Waterproof canvas and other protective shieldings may be used.

Small motors can be stored on racks, while larger equipment can be kept on skids or trucks, easily maneuverable. This is important particularly where frequent changes are made. Frequently it is necessary to convey substitute motors a considerable distance. Then it is desirable to have the transfering equipment best facilitating such work, to avoid confusion and time-loss.

It is expedient, in good motor storage, to give due consideration to bear-

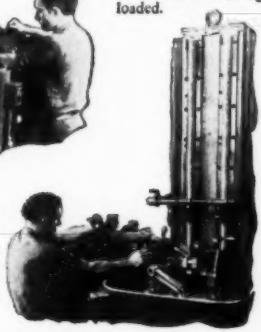
LINES BEHIND THE LINES

FROM PRODUCTION LINES TO FIRING LINES, IN WAR AS IN PEACE, THE AUTOMOTIVE INDUSTRY DELIVERS THE GOODS

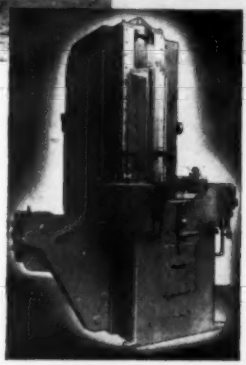
NO INDUSTRY has gone more "all out" for war than the automotive. None manufactures a greater amount or variety of war matériel. For many years the industry has relied on broaching as a better way to do many metal-working jobs—the only *right* way to do some!

* * *

RELATIVELY LOW COST Single Ram Machine performs two different surface broaching operations. One tool (left) broaches flat on rod, while second fixture is being loaded.



RADII ARE FINISHED (right) with second broach while first fixture is being re-loaded. One operator plus one machine plus tooling by *American*—equals a precision job at a production rate!



FAST PRODUCTION with high finish is obtained by broaching sides of articulated rod for aircraft engine, shown in position (left) on *American* SB-48-15-2 Single-Dual Machine.

BROACHING IS BETTER THE *American* WAY

American

BROACH AND MACHINE CO.

ANN ARBOR, MICHIGAN

•

BROACHING MACHINES
PRESSES
BROACHING TOOLS
SPECIAL MACHINERY

DIVISION OF S

ings, brushes, windings, oil, etc. Then the machine shop will have ready, in good-working condition, the correct additional equipment for each type of motor in use. A shop never can have too much of the right thing. It is doubly essential to maintain auxiliary equipment in fit, operating order. Using the wrong oil in a pinch, chancing on a lubricant the management knows is not just the right one for the purposes, represent a speculation, conducive to production set-backs. Often, the wrong oil may account for the correct motor not working properly.

It is necessary to do more than to provide duplicate motors for maximum production; an efficient, systematic check on the equipment must be kept. In these critical times, guess-work is out of place. If a certain immediately-needed motor must first undergo overhauling, considerable valuable time may go to pot fitting the motor for use.

Regular, consistent and proper motor maintenance must not be overlooked in the production rush.

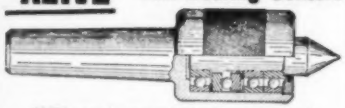
Improved Die Holder

A method of improving a die holder, which contributes materially to its efficiency in holding split dies, was recently suggested to the General Electric Co., by John Dellaria, a tool crib attendant. The method eliminates the tool steel wedges formerly used to fix the dies rigidly in the die holder, the objection to the wedges being that, in time, the sidewise pressure exerted by them frequently damages the die holder and the die.

The new method employs countersunk setscrews instead of the steel wedges. These screws are located in the shoulder of the die holder and are set at an angle of approximately 20 degrees, thus exerting a sidewise and slightly downward pressure on the die.

The new method also requires that the die be flared out somewhat at the bottom, with the die holder proportionately recessed to receive it.

"ALIVE" Ball Bearing Centers



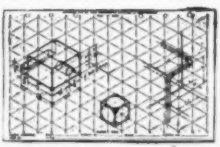
"They turn with the work"

Write TODAY—and let us tell you more about them.

MODERN MACHINE COMPANY

323 Berry St., Brooklyn, N. Y.

ISOMETRIC SKETCHES ARE EASY TO MAKE AND READ!



One trial will make you another steady user of WADE'S ISOMETRIC blue lined paper. Shows all surfaces and interior to scale. Makes clear blueprints. Saves time daily in hundreds of plants. Write for Circular.

Wade Instrument Co. 1422 E. 109th Street, Dept. H, Cleveland, Ohio

When You

TRACE A PROFILE

it *has* to be Accurate

That's the Secret of the Accuracy and Speed Attained in Trueing and Dressing Profile Forming Centerless Grinding Wheels with TRUCO Engineered Diamond Tools

The blade type diamond tool developed by Wheel Trueing Tool Company has helped to eliminate the difficulties of profile forming of centerless and other types of form grinding wheels.

Easier to set up, truer form and longer periods of use from one tool to the other result in a desirable uniformity and economy of production.

Many wheels are being trued to profile forms to accommodate parts needed in war production and not all forms require the same type of diamond tools.

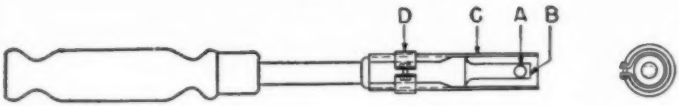
What's your problem? Write for further information.

Specialists in Diamond Tools for Straight, Radial or Step Dressing—Turning, Boring, Radius Forming, Gage, and Core Drilling Tools.

WHEEL TRUEING TOOL CO.

3200 W. DAVISON • DETROIT, MICHIGAN

Small Wire Soldering



The job of soldering small wire connections is simplified at General Electric by making the iron stationary and dipping the connections into a small hole filled with solder near the tip of the iron.

As shown by the drawing, the soldering iron can be fixed for use in this manner by drilling a hole (A) into the tip (B). A nickel steel tip will last longer than other types.

The drip and splash guard (C) catches surplus or drips of solder coming off the iron. It is made of 1/32-inch steel and is fastened to the iron with a hose clamp (D).

Too Hot to Handle

In 76 seconds, these war workers at the Lycoming Division of the Aviation Corp., Williamsport, Pa., install essential functional parts in a cast aluminum cylinder head heated to over 650 F. This cylinder head, one of many thousands now being made at Lycoming for aircraft engines, is heated in an electric oven for 2½ hours before work is started.

These men have fingers that move like lightning yet with perfect timing and team work, because a slip is dangerous and costly. Over a a dozen different operations must be made before the cyliner head has cooled 15 degrees. The three men shown, insert bronze intake and exhaust valve seats, place sparkplug bushings in position, secure a permanent seal at these places, screw into place a molybdenum

BREMIL MFG. COMPANY
1700 Pitts. Ave., Erie, Pa.

ALL-ALLOY compound lever strap cutter. Cuts 1½ strap with one stroke.

MOTOR MICA
REG. U. S. PAT. OFF.
ANTI-FRICTION COMPOUND

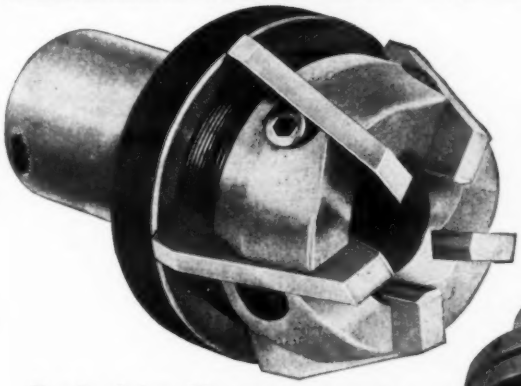
Motor-Mica will solve your toughest lubricating problems. Prevents metal to metal contact. Cools HOT BEARINGS.

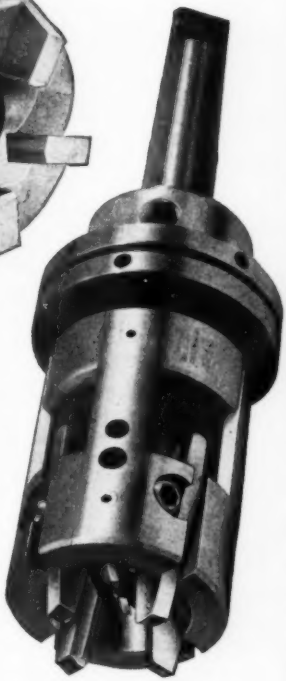
SPEEDS UP
Stamping, Turning, Drilling, Milling, Threading, Boring, Die-Casting, Tapping, Screw Machine, Other Operations

Immediate Deliveries
Packed in 5-10-25-50-100 lb. Containers
Write for free sample!

SCIENTIFIC LUBRICANTS COMPANY
Dept. H, 3462 N. Clark St., Chicago, Ill.

GENESEE ADJUSTABLE HOLLOW MILLS ARE BREAKING PRODUCTION RECORDS NOW JUST AS IN WORLD WAR 1





Backed by 35 years experience our entire facilities are devoted to the manufacture of inserted blade Genesee **ADJUSTABLE HOLLOW MILLS,** Facing and Counterboring Tools and Special Production Tools.

Our standard line of Hollow Mills include 16 styles and sizes from 0 to 2 inches; larger sizes upon request.

Our Engineering Department is always ready to serve you in your Production Tool problems.

Write for complete Catalog No. 42-H

GENESEE MANUFACTURING COMPANY

Manufacturers of

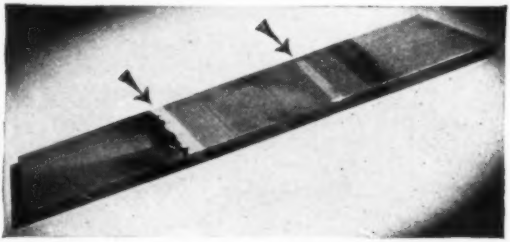
GENESEE PRODUCTION TOOLS

Established 1906 Rochester, N. Y. U. S. A.

steel forged cylinder barrel, insert intake and exhaust valve guides and drive into place the steel rocker arm bushings. The completed cylinder unit is stamped for identification and then water-tested at 450 pounds psi and again placed on the production line.

Such skill and team work is not always a requisite of war production workers, but in this instance one man out of step can destroy the cooperative efforts of all three men, and waste valuable time which is so vital to victory.

Continental Motors Cuts Aircraft Motor Cooling Fins With Tool Made of Scrap Steel



Large users of vital hss in cutting cooling fins for aircraft engines, Continental Motors Corp. is said to have effected great savings by utilizing scrap hss sections joined to mild steel bodies. The photograph illustrates how this company fabricates this unusual tool by chamfering joints in X shape and joining pieces with Castolin Eutectic Low Temperature Welding Alloy.

It is reported that numerous materials were tried on this job but none gave the strength required in such a cutting tool. Finally the desired strength was found in Castolin Eutectic made by Eutectic Welding Alloys Co., 40 Worth St., New York, N. Y. This low temperature alloy provided a joint at 1300° F with only localized heating—thus preventing annealing of the heat treated hss which retains its original hardness. Also, the cutting edges are not affected. With the serious scarcity of tools at present, the importance of this simple, efficient salvaging process is obvious.

Many dissimilar metals have been successfully welded by the process, such as chrome-moly to low carbon steel; tool steel to mild steel; stainless to mild steel; monel, nickel, brass, bronze, etc., to steel.

SIZING REAMER

An expandable sizing reamer, developed by methods man Henry Bernadt, of General Electric's Schenectady Works, provides a repetitive production tool for quickly and accurately reaming holes in ball-bearing housings. Because the tool is said to be absolutely reliable, even in the

SPEED-UP YOUR PRODUCTION with

G-W—Special "C" Tool Bits
G-W—Special "T" Tool Bits

GERITY-WAYNE TOOL COMPANY
6432 Cass Ave. Detroit, Mich.

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Numbering Machines
Automatic and Hand Operated
for stamping in Metal, Fibre, Plastics, etc. Do faster and better work than Single Steel Stamps.
For Marking Metal Parts, Name Plates, Metal Checks, etc.
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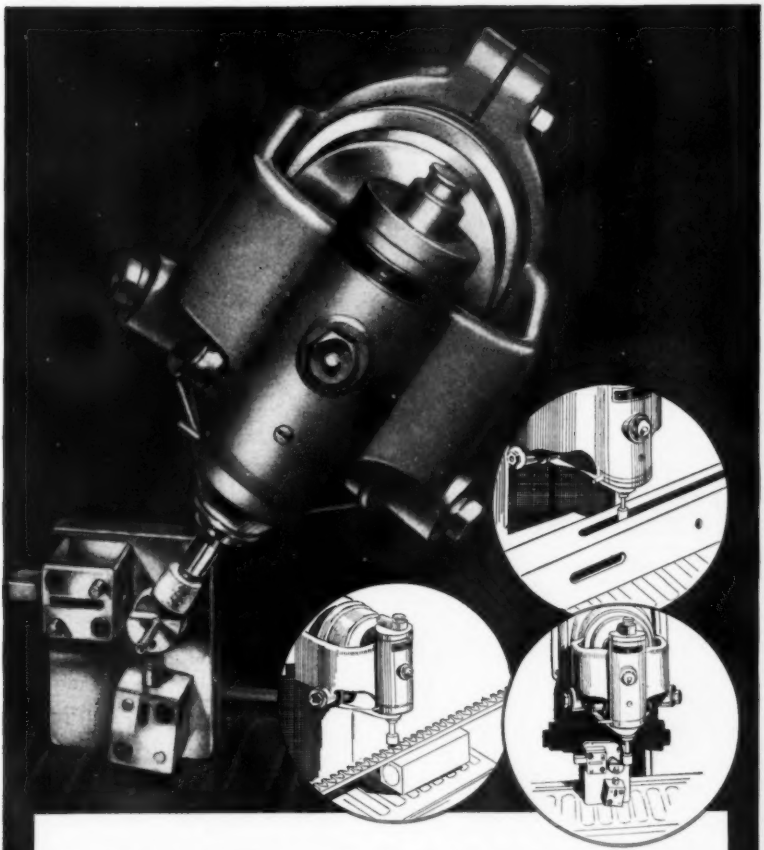
NUMBERALL STAMP & TOOL CO., Inc.
Huguenot Park, - - - Staten Island, N. Y.



LIBERTY *High Speed* **Attachments**

Grinds to closest tolerances. May be assembled to many popular surface grinders in as little as 2 minutes. Grinds many difficult slots, recesses, hard-to-get-at surfaces. Improved spindle always in perfect static and dynamic balance.

LIBERTY TOOL AND GAGE WORKS, INC.

231 GEORGIA AVENUE **PROVIDENCE, R. I.**

Tomorrow's Tools for Today's Tasks

WHITNEY-JENSEN PRODUCTS
20 YEARS EXPERIENCE

POWER PUNCH PRESSES

Two sizes, 12" and 18" throat depth. Capacity 10 tons, length of stroke 1¼", stroke adjustment 1¾", die space 6". Economical small-size machines for accurate work. Whitney-JENSEN construction features insure durability. Full data on request.

Write for new Whitney-JENSEN AIRCRAFT TOOLS CATALOG

WHITNEY METAL TOOL COMPANY
115 FORBES ST. • ROCKFORD, ILL.

One Machine **THE PANTO**

does all three . . .

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Instrument dials, name plates, identification tags . . . letters, figures, designs.

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Machine parts and tools, heat-treated or annealed . . . on flat, concave, or convex surfaces.

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For applications where electric marking can not be used.

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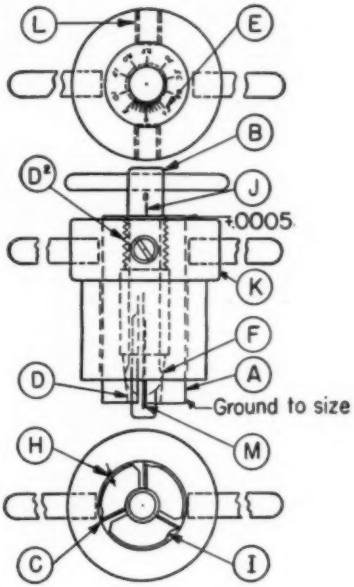
H. P. PREIS ENGRAVING MACHINE CO.
157A SUMMIT ST. NEWARK, NEW JERSEY

hands of an unskilled workman, it has materially speeded production of an important ordnance item. Holes bored 0.001 to 0.002" under size are finished with the reamer to a tolerance of between 0.0002 and 0.0003".

The tool is essentially an expansion reamer, designed for a cut of about 0.0005" per turn. G. E. has many sizes in operation, ranging from ½ to 6½" in diameter. Some are being used on rabbet and hub fits and other male parts which require accuracy.



Expandable Sizing Reamer For Ball-Bearing Fits

The reamer is provided with a micrometer setting adjustment with 50 equal divisions shown on the index dial. In setting up for production, the tool is first reduced in diameter and inserted into the bore of a trial piece. Then it is expanded and the proper index number on the dial is established for the finished tolerance.

KUTKOST

THE NEW CENTRIFUGALLY CAST CUTTING ALLOY, CONTAINING BORON.

MANY OF THE PRESENT USERS ARE ACCLAIMING KUTKOST AS THE BEST "ALL AROUND" OR "ALL PURPOSE" MATERIAL THEY HAVE EVER USED.

NOW READY FOR DELIVERY IN THE FOLLOWING SIZES:

SIZE	PRICE EACH	SIZE	PRICE EACH
¼ x ¼ x 2¼	.95	7/16 x 7/16 x 3½	2.40
5/16 x 5/16 x 2½	1.25	½ x ½ x 4	3.25
⅜ x ⅜ x 3	1.65	⅝ x ⅝ x 4	4.70

KUTKOST is supplied in three grades:

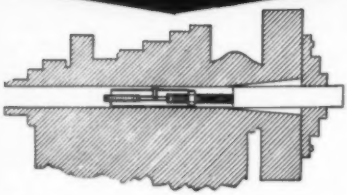
GRADE V : For heavy roughing on all types of high tensile strength materials (1/32" to 1/8" feed)
Rockwell "C" hardness 61-64

GRADE X : For medium roughing and semi finish on all high tensile strength materials (.010" to .032" feed)
Rockwell "C" hardness 65-67

GRADE XV For finishing cuts on all types of materials. Also roughing and semi finish on low tensile strength materials such as bakelite, brass, bronze, aluminum, copper, etc.
Rockwell "C" hardness 68-70

GENERAL TOOL & DIE CO.
555 Prospect St., East Orange, N. J.

NOW!
SPEED WAR PRODUCTION
with this NEW
CARLSON No. 101
SPINDLE LATHE STOP



Here is an amazing new attachment which greatly simplifies lathe operation, especially in mass production work. Easily attached in few seconds. Inexpensive. Sizes to fit lathes of all types and makes.

- Increases and Speeds Production
- Reduces Rejects
- Saves Set-Up Time
- Assures Uniform Accuracy
- Requires Only Semi-Skilled Operator

MODEL No. 101—Fits all bench-type lathes including South Bend, Logan, Atlas, Sheldon and other makes..... 5.95

ORDER TODAY! Please give type of lathe and inside diameter of lathe spindle.

SOLE AGENTS
SCHULTZ & ANDERSON CO.
109 EDISON PLACE, NEWARK, N. J.

Manufactured by
GREENFIELD MACHINE AND TOOL WORKS

The reamer is then ready for use on regular production work.

The accompanying drawing shows the construction details of the tool.

Reamer "A" is made of a good grade of steel. Adjusting screw "B" is made of tool steel. Both are hardened and ground. Three flutes "C" are milled to eliminate chatter. Taper of the hole "D" is 0.100″ in diameter to 1.00″ of length and the screw "B" has 20 threads (D2) to the inch. This arrangement gives an adjustment of 0.0001″ expansion to each division (E). The balled part "F" governs adjustment.

Before grinding the outside diameter of "A", it must be expanded about 0.005″ and kept under tension while grinding on screw "B." The cutting end is ground to the desired diameter and the other end about 0.0005″ plus. This will prevent any "undercutting" of the hole when reaming.

Clearance "H" back of the rake "I" is reduced only about 0.0003″ on a side to prevent excessive expanding and also help keep the reamer in line.

Before use, the screw "B" is retarded about one turn, inserted into the bore and expanded to the proper diameter, which is governed by graduations "E" and reference line "J." The proper line is established by the first hole, reaming a little at a time. The following holes will be duplicated when adjusted to the same line.

Sleeve "K" is used as a driver and also as a stop when the depth of bore must be sized by facing cutting edge "M." Screws "L" are for adjustment of the sleeve.

For his work in developing many time-reducing and labor-saving devices of this nature, Henry Bernadt received one of the 37 Charles A. Coffin awards to G-E employees in 1942. A native of Austria, he has been with G.E. continuously since 1910, when he was employed as a toolmaker.

AUTOMATIC CLAMPING FACE PLATE

By C. T. Packer
Westinghouse Electric & Mfg. Co., Lima, O.

To fill a requirement for rapid production, an automatic clamping face plate was developed for one of the operations on a generator end bracket. The plate can be used on items that can be clamped from the inside and have either openings

Well Received AND SINCE SUCCESSFUL BECAUSE FILLING A *Specific Need!*

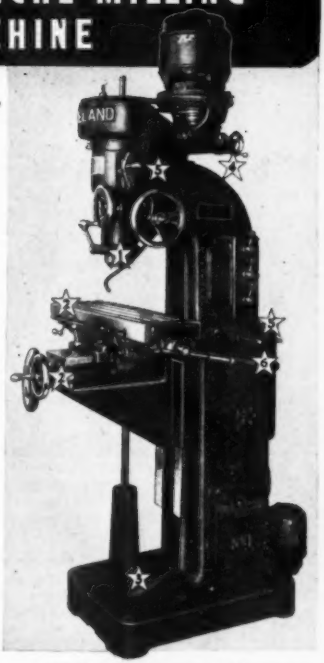
THE *Cleveland* NO. 1 VERTICAL MILLING MACHINE

WELCOMED by war plants and wherever production *with accuracy* is of first importance, the Cleveland No. 1 Vertical Milling Machine has made good every promise. Features:

1. Big, husky spindle of chrome nickel steel heat-treated and mounted on 200-lb. preloaded precision bearings.
2. All lead screws and feed gears mounted on Timken bearings for smooth, quiet running and longer life.
3. Coolant sump in base. (Pump optional.)
4. Hand wheel and lead screw on spindle head for quick shifting of belts for changes of spindle speeds.
5. Also 3 speed changes on back gears, giving 12 speeds in all.
6. Feed box driven by ⅓ h.p. motor through V-belt with 3 speed changes on pulleys and 4 in gear box; 12 feeds in all to table.

Overload protection on all motors to prevent motor failure and resultant breaks in production. Longitudinal feed, 18"; cross travel, 8½"; vertical travel, 16". Table working surface, 8" x 32". Cutter capacity, $\frac{1}{16}$" to 2½" mills. Spindle speeds, 100 r. p. m. to 1800 r. p. m.

The Cleveland No. 1 is fast, powerful and rugged. It has amply satisfied the requirements of modern tool rooms, die and mold shops and production plants.



Ask for Sommer & Adams Bulletin "B"

THE SOMMER & ADAMS COMPANY
18511 EUCLID AVENUE • CLEVELAND, OHIO
Custom-Built EQUIPMENT FOR MANY PURPOSES

through the side or ledges on which the clamps can rest.

The novel clamping scheme is accomplished by two different basic principles. First, centrifugal force caused by spindle rotation positions two clamps and, second, by the inertia of a hand wheel and rod thru the spindle which tightens the clamps. The thru rod passes thru a left-hand thread nut which carries the rod forward by its inertia against the inside of the clamps which are hinged on links. A pressure button is mounted on the end of the thru rod to apply pressure against the clamps. The thrust between the rod and pressure button is taken on a steel ball. The spindle runs at 1,000 rpm.

A garter spring is hooked to the two clamps with sufficient tension to hold the clamps to the center of the face plate to facilitate loading.

OILSTONES GO TO WAR

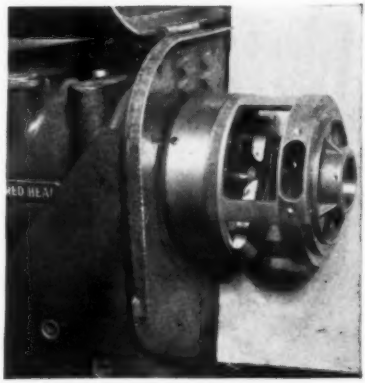
The microscope teaches that there is no such thing as a smooth cutting edge. Whether it be razorblade or cutting tool, the edge consists of minute, saw-like teeth. In cutting, these bend under or break off, causing dullness.

Grinding restores the "teeth" to upright position. However, not without leaving a burr or "wire edge". That's where honing comes in! It removes the burr, making for greater keeness of the edge.

Woodworkers had long been aware of these facts, and barbers probably before woodworkers, since stropping is but a further progression in the grinding-honing process. But in the metalworking, shops,these facts had been seemingly forgotten.....forgotten, says Behr-Manning Div., Norton Co., Troy, N.Y. until they brought them again to atention.

Back in March, 1939, Behr-Manning started campaigning for keener cutting edges, via the oilstone after-grinding treatment. With war production's zoom to record highs, the treatment has proved important. How important, can be measured by the firm's increased sales of oilstones. On the items used for tool-honing, sales are 8 times more than they were 3 years ago!

It accounts for many of the signs making their appearance in shops, telling about the advantages of oilstoning edge tools after grinding...how it lengthens edge-life and tool-life...saves trips to the grinding wheel...helps every machine

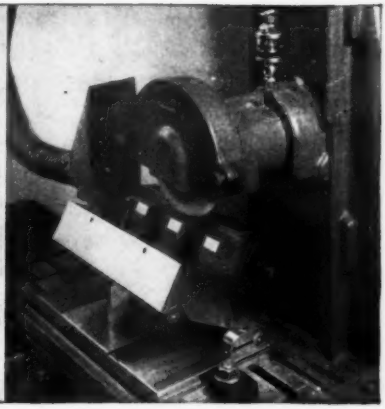


tool to produce rated-and-better capacity ...and helping to conserve critical tool steel in this greatest of our country's emergencies.

If you have any special problem along this line, Behr-Manning will be glad to send you their literature.

The modern "Stage Door Johnny"—Courtesy, Westinghouse.

Faster
MORE ACCURATE
GRINDING SET-UPS
with



The MAGNA-SINE

The grinding job shown above was set-up in just a few seconds using a Magna Sine. Three identical parts are being ground at one time . . . yet there is no danger that distortion from clamping or slipping on the table will turn the work into scrap.

The pieces are held securely by the turn of a switch. They are released with equal ease. Thus several similar parts can be ground in succession without disturbing the set-up.

The Magna-Sine employs the sine bar method, the only really accurate method of determining angles. It is precision built so that it is accurate to the limits of the gage blocks employed.

The Magna-Sine is manufactured for both single and compound angle work in two sizes. A non-magnetic sine plate built to the same close limits as the Magna-Sine is also available for inspection. Write us today for complete information.

ROBBINS ENGINEERING COMPANY
318 MIDLAND AVENUE • DETROIT, MICHIGAN

IDLE EQUIPMENT
HELPS THE AXIS!

FIND A USE FOR IT - - - - OR SCRAP IT!

NOW is the time to look over all the machinery and materials that this war has forced into idleness. Every pound of it can be helping the war effort. And if it isn't, then it's helping der Fuehrer!

Scrap Is Ammunition

Look at it this way. There is, in America, the worst shortage of equipment of every sort that has ever faced us. There is an even greater lack of heavy scrap. **You** can help relieve these shortages. You can add to the Nation's productive might. You can help provide the steel that will drive the Hun and Jap back into their holes to die.

You owe it to your Country, and to the boys that face these gangster nations, to do this thing that's asked of you. And don't pass off your responsibility by saying that you've already done the job....**because you haven't!**

First Scrap Hunt—Just a Starter

Even if you've recently carried out a scrap drive in your shop, surveys prove there is always plenty that is missed the first time. You can prove this for yourself, simply by taking a careful look around. Remember—if you are hanging on to material or equipment on the basis that you may need it after the war, you're not only holding out on our fighting men . . . you're fooling yourself as well. For it's going to take everything we've got to win this war —and if we **don't** win, the stuff you've **hoarded** won't do you a nickel's worth of good.

If you haven't started a Salvage Committee working yet—get going now. Pick a high executive as Salvage Manager; one who has the authority to get things done. Write to this magazine, if you wish, for help in getting a real salvage program rolling.

Your Idle Equipment Is 1-A

Nobody's asking you to give valuable machinery and materials away unless you want to. There's a ready market for heavy industrial scrap—it's needed in tremendous quantities to mix with the mountains of flimsy household scrap collected last Fall. Used Equipment Dealers and Scrap Dealers will purchase usable pieces at good prices. These dealers can be located in the classified telephone book.

Decide right now to get going on this thing—and don't let anything delay you further. See to it that your own personal scrap record does not read . . . "TOO LITTLE AND TOO LATE!"

Follow this rule

If it hasn't been used for three months, and if someone can't prove that it's going to be used in the next three — sell it* — or scrap it!

Here's what to look for

Obsolete machinery, tools, equipment, dies, jigs, fixtures, etc., which are incapable of current or immediate future use in the war production effort because they are broken, worn out, irreparable, dismantled or in need of unavailable parts necessary to re-employment.

***Scrap and Used Equipment Dealers pay well for usable machinery and materials.**

BUSINESS PRESS INDUSTRIAL SCRAP COMMITTEE

ROOM 3303, EMPIRE STATE BLDG., N. Y. C.

If you have done a successful salvage job at your plant, send details and pictures to this magazine.

SEND FOR THIS SCRAP MANUAL TO HELP YOU TACKLE THE SALVAGE PROBLEM.

Business Press Industrial Scrap Committee
Room 3303, Empire State Bldg., N. Y. C.

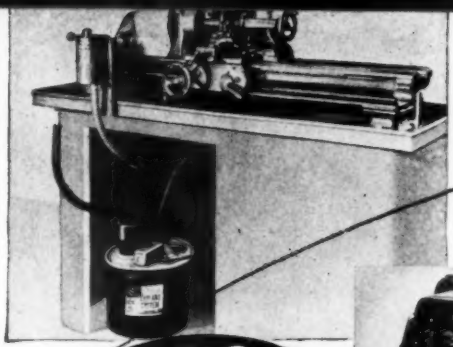
Please send scrap manual

Your name .....

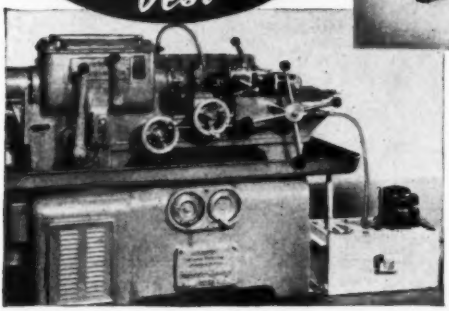
Company name .....

Company address .....

Gray-Mills *Portable* COOLANT SYSTEMS



HELP good LATHES do their best



SAVE *time and tools — increase production* by applying Gray-Mills Systems to your machine tools and equipment. The advantages of coolants have been given to lathes, like those above, by the simple and economical addition of coolant return pans and Gray-Mills Coolant Systems. Similarly equipped, hundreds of machines for milling, cutting, drilling, tapping, honing, belt grinding, sawing, etc. are producing more and better work. Gray-Mills Systems are the answer to increased efficiency in small, large or special tools—or as standby and "cleanout" systems. They are available in pump capacities from 50 to 1,000-gals. per hour—controlled flow. Prices range from $39.50 to $132.50. Call your distributor or write for full details. Gray-Mills Company, 215 W. Ontario St., Chicago.

Gray-Mills Self-contained Coolant Systems operate independently of the machine tool and thus assure complete freedom from unnecessary vibration and accuracy-destroying motor harmonics.

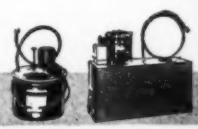
IMMEDIATE DELIVERY

FLO-BAC COOLANTS

Five types of quality cutting fluids to cover practically every requirement. Available in 10 and 55 gal. containers. Immediate delivery from your distributer, or our plant.

GRAY-MILLS

COMPLETE PORTABLE COOLANT SYSTEMS



Capacities 50 to 1000 G.P.H.

New Tools and Equipment

Cone Point and Circular-Pitch Testing Fixtures

THE Fellows Gear Shaper Co., Springfield, Vermont, offers two new devices for checking gears. One of the Fixtures known as a cone-pointed testing fixture, shown in Fig. 1 is used for checking concentricity of pitch circle; the other fixture is used for checking the circular pitch, or tooth to tooth spacing. Both fixtures have a maximum capacity for gears up to 12" pitch diameter, the maximum distance between centers being 15".

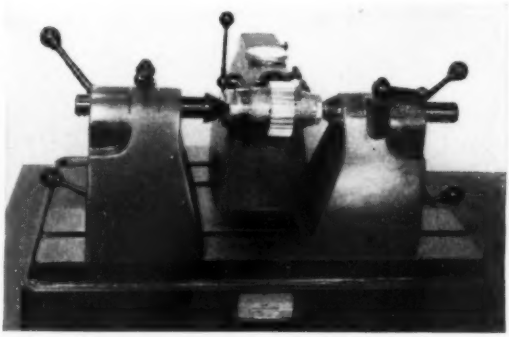


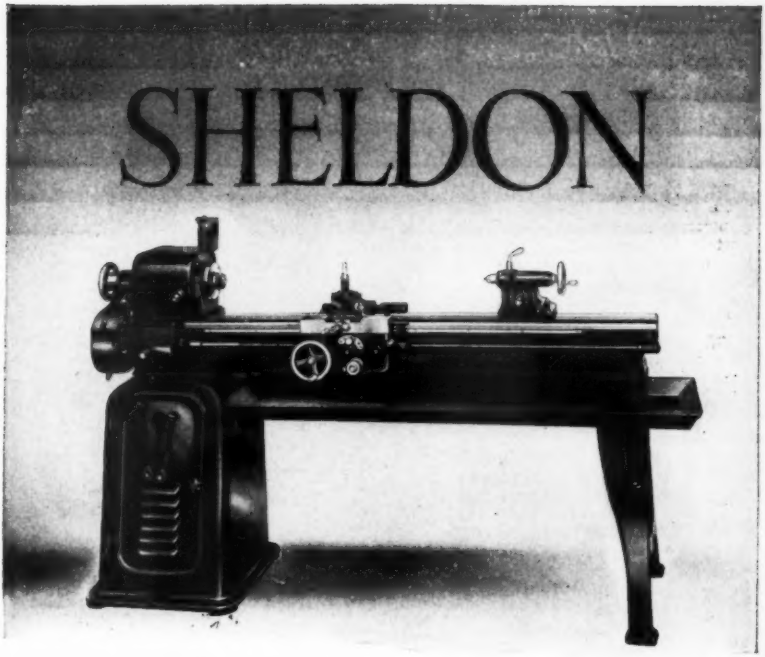
Fig. 1—Fellows Cone-Point Testing Fixture for use in checking concentricity of external spur and helical.

Fig. 2—Similar fixture for checking circular pitch or tooth-to-tooth spacing.

These fixtures comprise a base upon which 3 adjustable brackets are mounted. Two of the brackets carry the work-holding centers; and the third bracket, which is located at right-angles to the brackets carrying the centers, retains the measuring pointers, fingers and dial indicator, as well as the indexing mechanism.

The head-and tail-stock brackets are provided with clamping levers. The spindles carrying the centers are adjusted through a rack and pinion, and are clamped by levers. The bracket, carrying the measuring pointers, can be located in 2 positions, which together with the adjustable spindle, will handle any gear within capacity of the fixtures. A work-indexing device is connected to the lever operating the pointer holder, which on the return stroke automatically indexes the work. The indexing fingers are adjustable for different pitches and numbers of teeth.

On the circular-pitch testing fixture,



Sheldon BBU-1242 WQ
Precision Lathe

This quality 12 in. ball bearing tool room lathe is built for precision work and will retain its accuracy under long and hard usage. It has extra collet capacity (to 1" round), the finest precision ball or roller bearings obtainable, an improved heavy-duty, double wall apron with power cross feed; full quick change gears and full bowl headstock. Its improved Sheldon 4-speed, V-belt, lever-clutch operated, underneath motor drive is entirely enclosed in the pedestal leg and has anti-friction bearings. It is so designed that spindle belts operate thru a *standard* 1-piece bed. This bed is bridge-braced with heavy cross girts and has hand scraped ways—2-V ways and 2 flat ways.

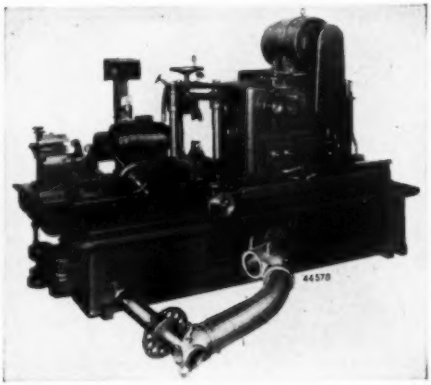
If interested in 10", 11" and 12" quality lathes be sure to see the SHELDON.

SHELDON MACHINE CO., INC.
4242 N. KNOX AVE. CHICAGO, U. S. A.

shown in Fig. 2, the spindle carrying the locating and measuring fingers is provided with a graduated collar at the rear end, so that the fingers can be set normal to the helix, if desired when checking helical gears. The "measuring" brackets for cone-point and circular-pitch testing are interchangeable on the same base. These fixtures are intended for use on a bench.

Single Spindle Hydraulic Boring and Facing Machine

This machine was designed and built by Snyder Tool & Engineering Co., Detroit, to meet a special problem encountered by an aircraft manufacturer in accurately boring and facing parts that have a tendency to vary in length slightly. The part is illustrated at base of machine.



The single-spindle hydraulic boring and facing machine is equipped with a unit having a heavy-duty worm wheel driven spindle, which can be operated at any one of 8 readily selected speeds.

Tooling consists of a breech lock spindle adaptor and various boring, facing and undercutting tools. The distances which the various tools feed through the work piece are controlled by a revolving control dog rail, which is quickly set up for each individual tool. Following each work cycle, the spindle returns to position and the operator can quickly exchange tools.

The work holding fixture is manually operated. The part is located and clamped against two ground diameters on a shaft exactly at right angles to the boss that is to be bored. Because the parts vary slightly in length, it became necessary to provide on the fixture a means of indicating the stock variation and then compensating for it by moving the solid stops on the spindle unit. The part length indicator, beneath the electric push buttons, detects the amount of variation, which is compensated for by setting the second indicator, above the chip chute at front of fixture, at a reading corresponding to that of the part length indicator. Final clamping of hub to be bored and faced is done through equalizing Vee jaws.

Because rate of output, accuracy and safety are built into this special machine, unskilled help can learn to operate it in relatively short time.

Rotary Files

These files are available in a number of different styles and sizes, in either High Carbon Steel or High Speed Steel.

Send for catalog showing a wide variety of standard shapes and special shapes. Perhaps we have what you want in stock, if not, we can grind it.

The Rotary File Co.

Hand Cut

If you have need for special shape Files, we shall be glad to submit the desired File for your approval and trial upon receipt of a sample or sketch.

This service is designed especially for your convenience, for which we make no charge.

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Your Clearing House for Tough Jobs

• Industry is taking full advantage of this mo ern way to better, faster, more uniform filing any tool or part made from steel, copper, al minum, and their alloys, ferrous castings, plastic laminated products, also ticklish and difficult-t finish materials.

Skilled metallurgists and latest equipment, inclu ing the new photomicroscope, make this Researc Laboratory the best testing ground in the country overcome filing difficulties. Manufacturers are happ with results and so are we.

Send us one or more actual parts and we'll get bus at once — determine the proper file, best speed, tab tilt, coolant, etc. to lick your problem. Costs you nothin —may save thousands of man hours and dollars.

THE CATERPILLAR PRINCIPLE

APPLIED TO FILING

SEE HOW DoAll File Bands WORK

Bakelite Terminal Blocks

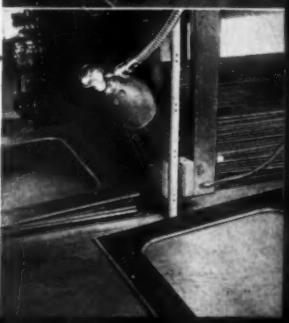
Job sent in by Providence, R. I., manufacturer, to determine the best method to dress off Bakelite and expose the brass inserts. Result: Use ¼" flat medium cut file, 24 pitch run at 270 f.p.m. Time required—1 minute for 9 faces per block. DoAll File Band lasts 75 hours and machines 4,500 of these blocks.

DoAll Band Files

Each is made up of a series of 3" segments mounted on a steel tape, interlocked with each other to form an even, solid, continuous, one-way travel surface that gets filing done in 1/5 the time of jig filing, ⅛ that of hand filing.

Hot Rolled Plates

Size 3/16" thick, 14" square. To determine time saving through use of band filing, as compared with former method. Result: Use ½" oval, 14 pitch file run at 85 f.p.m. 50% to 60% saving effected and square, uniform finish obtained.



Send for pocket-size Band Filing Book, listing all sizes and styles of DoAll Files.

THE DOALL COMPANY

1206 Thacker Street — Des Plaines, Illinois

DoAll Branches in 25 cities, each in charge of a trained sales engineer to give you quick service. Consult your phone book.

You can CHANGE 4 TOOLS quickly and accurately

When a job calls for one to four tool changes and a turret lathe isn't available . . . put a Colwell turret on your engine lathe. Then you'll get semi-automatic operation. For it only takes a few seconds to accurately change from one tool to another.

Colwell turrets carry a cutting-off tool and 3 square tool bits or 4 tool bits. Send for our new folder and specifications.

S.G.COLWELL
25 CONGRESS · AVE.
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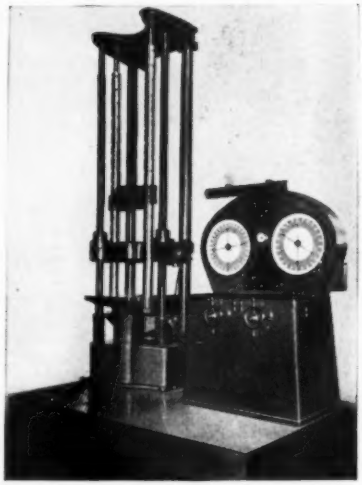
Giant Testing Machine



A 1,000,000 pound testing machine, built by the Southwark Division of The Baldwin Locomotive Works, has been installed in the new Northwestern University Technological Institute, Evanston, Ill.

This machine is one of a group of scientific devices built for the institution to further, thru undergraduate study and extensive research projects, new effectiveness in the implements of war and higher living standards with the return to peace.

This huge, powerful machine stands 2 stories high and can handle members up to 18 feet high for tests in either tension or compression. It is capable of applying transverse loads up to 1,000,000 pounds on girders or rigid frames up to 55 feet wide and 18 feet in height. The distributed or torsional loads can also be applied by means of a series of hydraulic jacks and connections to the massive concrete foundation's girders.

The machine is equipped with two 20-inch dials with four scale ranges 0 to 50,000, 0 to 200,000, 0 to 500,000 and 0 to 1,000,000 lb.

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Every dollar invested in

BOICE-CRANE POWER TOOLS

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PRECISION-BUILT
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does the work of two spent on oversize machines

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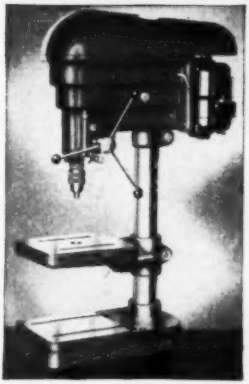
Helmet Head Drill Press



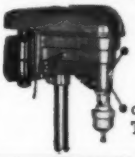
One, two, three and four spindle types. High and slow speed; bench or floor type; slotted or trough table.

Perfectly balanced and vibrationless.

Sealed against hazards common in other presses. The only drill press priced under $100.00 that gives you an approved guard without extra cost; the first guard that allows easy speed changing.

5 carefully predetermined efficient speeds, one for every operation. New self-centering 30-degree pressure angle 6-tooth involute spline. Spindle, quill, and spindle-pulley are held in permanent, perfect alignment.

The quill, longer and larger in diameter, is held by three bearings, permitting long holes to be drilled more accurately than by other presses in same price range. It is unquestionably the most durable and sensitive of any press in its class.



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FOR HELMET HEAD DRILL PRESSES

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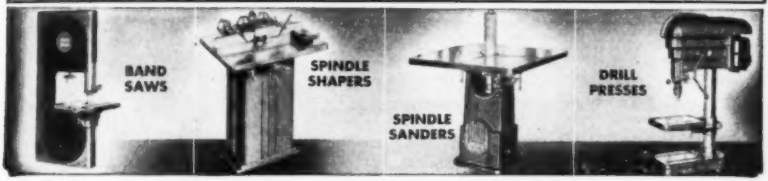

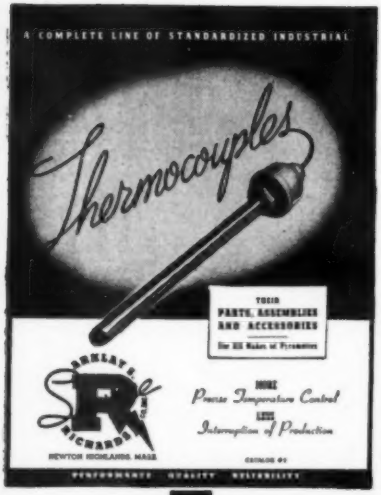

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AUTOMATIC SAFETY CONTROL

Fully automatic safety interlocked control is provided on the Bliss Hydro-Dynamic 2500-ton Six Die Slide Aircraft Press so that improper operation is claimed to be impossible and hence danger of accidents is reduced to a minimum.

The fully automatic operation by push button with independent control of pressure on each station and with the interlocks, eliminating necessity of a master operator, permits the heavy slides to be moved in and out of the press with ease and smoothness. This permits employment of feminine labor since there is no laborious work of locating die slides or re-arranging work within the press. At the same time, the safety interlocks make it possible to use inexperienced labor. Three to four girls may be used on each of the die slides, permitting loading of the many pieces on each die slide by as many as 24 girls and insuring continuous high production at all times.

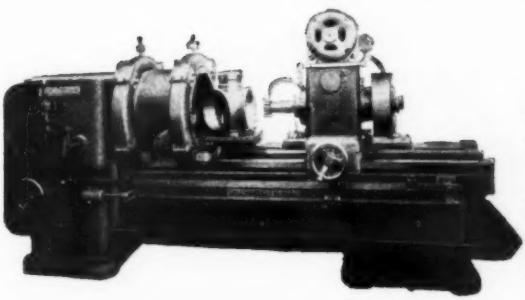
Further details are available from E. W. Bliss Co., 53rd St. and 2nd Ave., Brooklyn, N. Y.

PIPE BENDER BULLETIN

A bulletin summarizing more than a quarter century of manufacturing pipe-bending equipment, by American Pipe Bending Machine Co., 37 Pearl St., Boston, should be handy for those with problems or production along this line.

MOREY DESIGNED AND BUILT *For* PRECISION *Plus* PRODUCTION

MOREY-SHIELDS THREAD MILLING MACHINE



Maximum diameter	Distance between centers
12"	60"
12"	90"
12"	120"

Longer beds to order

• Hole through spindle 4 1/16" . . . Headstock—a complete self-contained unit . . . Simplicity in selecting varying cutter speeds and feeds . . . Extra heavy and rigid bed section...Motor driven cutter head, fully universal . . . Control—convenient to operator . . . Equally efficient for external or internal thread milling, with either single cutter or a hob.

Ask for Circular No. 737

MOREY MACHINERY CO., INC
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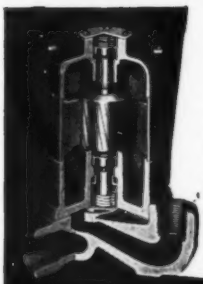

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Durable! This pump stands up under hard use. Hydraulic efficiency as high as 70%. Quickly installed by any shop man at little cost and easily moved from one job to another. Controlled flow—60 g. p. h. with ⅜" tubing to 1200 g. p. h. with 1" pipe. ½ H. P. NEMA motor meets any demand with negligible current cost.

Tank With Built-in Baffle. 12"x12" heavy galvanized sheet iron with baffle separator to collect heavy chips. Painted machinery gray outside. Removable lid for cleaning without disconnecting return piping.

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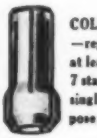

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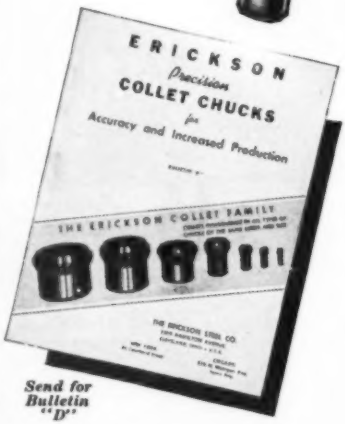
—replaces at least 7 standard single purpose collets



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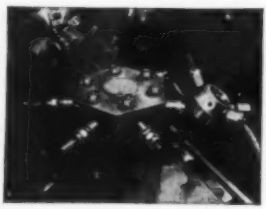


ERICKSON CHUCKS—standard equipment in many leading war production plants.

ERICKSON STEEL CO.
2309 Hamilton Ave. Cleveland, Ohio

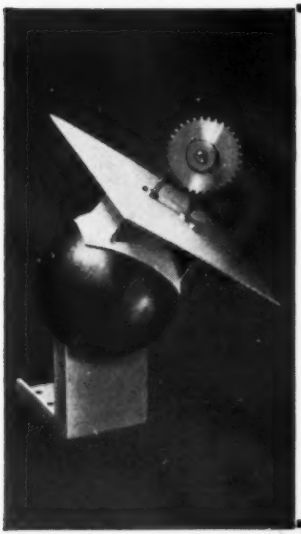
Just announced is the company's new M-5 hand-operated bender, capacity, 1¼ to 6" inclusive, with option of 2 bending sets, one each, 3 to 1 and 5 to 1 radius. No. 2 Set, says the firm, bends all sizes from 1 to 4" inclusive, cold; 5 to 6" in hot. Set No. 3 bends all sizes from 1¼ to 6" inclusive.

Also listed and illustrated with full specifications are models and auxiliary apparatus covering every practicable pipe-bending need.

AIR-OPERATED PRESS TYPE WELDERS

Series P-50 and P-100 automatic air-operated press type welders have recently been added to the electric welder line of the Pier Equipment Mfg. Co., 1468 Milton St. Benton Harbor, Mich. These welders are designed for high speed precision projection and general spot resistance welding of sheet and structural steel assemblies, wire and non-ferrous metals.

They are equipped with double acting air cylinder and control valves to provide for smooth, speedy action. Pressures depend on the size of cylinders and range from 800 to 4000 pounds, readily adjustable by means of a regulating valve. Die platens with "T" slots hold projection welding dies, while for spot welding operation each welder is supplied with two 2½" diameter by 8" copper horns machined to accommodate 1¼" water-cooled electrode holders either at right angles or in offset position. Standard throat depths are 12 and 24".



BOSWORTH WELDING POSITIONER

A NEW MANUAL UNIVERSAL POSITIONER THAT WILL SOLVE YOUR LIGHT WELDING ASSEMBLY PROBLEMS.

Built especially to help you "Speed Up" your production on AIRCRAFT SUB-ASSEMBLIES — RADIO CHASSIS ASSEMBLIES and SIMILAR WORK.

Ball and socket joint operation assures minimum handling and breakage — Ruggedly built to withstand continual use.

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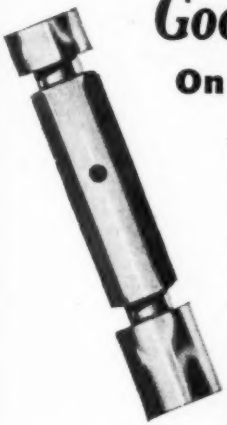

Good Delivery Dates

On All Standard Design and Special Plug Gages

American Gage Design Standard or Special Plug Gages.

Very good delivery dates.

Material for gaging members is HYCC steel.

Finish—Super finish.

Tolerances as per request.

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HYBCO TAP GRINDERS

For Sharpening

CHAMFER - FLUTES - SPIRAL POINTS

CAPACITIES:

Machine Screws to 1½" hand taps.

Can be arranged for any number of flutes —right or left hand.

ALL TAPS HELD BY SHANK.

Can be sharpened after center is destroyed.

Write for catalog—and send us your problem.

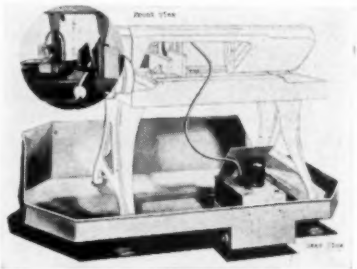
HENRY P. BOGGIS & CO.

1279 W. 3rd St. Cleveland, Ohio

The series P-50 is made in two transformer capacities, 30 and 50 KVA; and the P-100 (one of which is shown in the accompanying illustration) in 75, 100 and 150 KVA. The P-50's are supplied with either 4 or 5" cylinders with 6 and 8" for the P-100's. NEMA Type 1, 2 and 3 controls of weld timing and sequence are available, making almost limitless combinations of operations possible with little effort on the part of the operator.

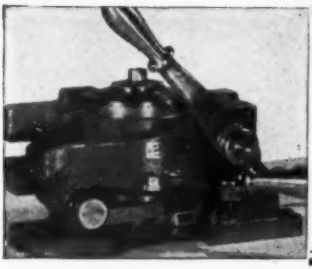
BAND SAW COOLANT SYSTEM

Advantages of using coolants in metal cutting operations on horizontal type band saws are claimed through application of a coolant system offered by Gray-Mills Co., 215 W. Ontario St., Chicago. Careful studies and tests made in the Gray-Mills laboratory demonstrated that coolants, properly applied, allow saw speeds to be increased, with smoother cuts and reduced blade wear. Production is said to have upped as much as 150%.



The system, Model S-20, is designed to fit all types of horizontal band saws. It has a pump of ample capacity mounted in a coolant return pan which in turn is attached below the saw to the legs. Being larger than the saw itself, all fluid is caught by the pan and returned to the pump for recirculation. Anti-splash shields guard the pump and operator from oil. The entire system is easily attached or removed; no drilling or alteration of the saw is necessary. Another unusual feature is found in the oil feed tube which is slotted to fit the saw blade, assuring full distribution of oil over the blade.

A specially blended cutting oil for band saw applications has been developed by the firm to assure highest saw cutting efficiency. Called "Flo-Bac" Saw-Kut No. 5, it has been added to Gray-Mills' line of "Flo-Bac" Coolants.



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WITH THE

NEW Dearborn Automatic Chucking and Indexing Fixture

Work held by draw in collets. Collets open and close automatically. Work automatically ejected. Indexes without loss of time for milling 1, 2, 3, 4, 6, 8, 12 or 24 sided pieces. Minimum set-up time required. Speeds up production. Positive and accurate in operation.

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All standard sizes carried in stock for immediate delivery. Special cutters made to Blue Print.

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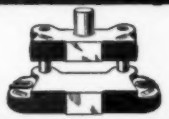

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SAVES SCRAP from floors, bins, etc. Pick it up with the powerful suction of the TORNADO Portable Industrial Vacuum Cleaner. Cleans floors, walls, lineshafting, etc. Attachments for cleaning everything.

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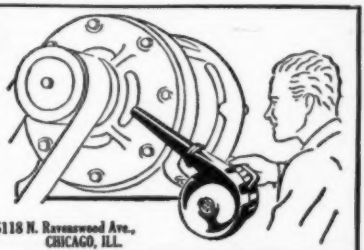
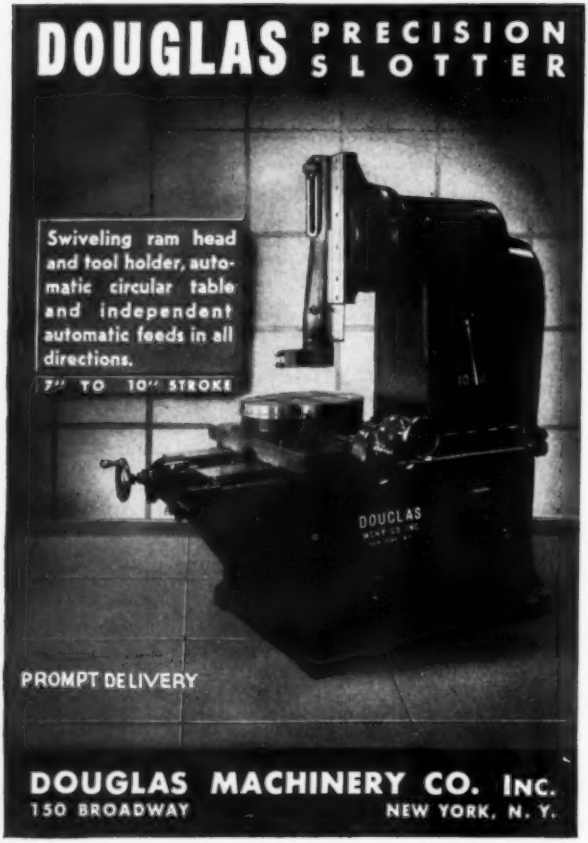


BREUER ELECTRIC MFG. CO., 5118 N. Ravenswood Ave., CHICAGO, ILL.


DOUGLAS PRECISION SLOTTER
Swiveling ram head and tool holder, automatic circular table and independent automatic feeds in all directions.
7" TO 10" STROKE
DOUGLAS
PROMPT DELIVERY
DOUGLAS MACHINERY CO. INC.
150 BROADWAY
NEW YORK, N. Y.

removes burrs from the work. It has hung up production records of 3,000 slotted nuts per hour. Hex nuts in all of the smaller sizes up to 15/16" across the flats, are handled.

One manufacturer of tapping equipment, recognizing high speed feeding and tapping of nuts as basic, if costs are to be held down, developed an interesting standard nut fixture for feeding, holding, and ejecting. On a suitable fixture foundation of rigid type is a slideway for the nuts, centered directly under the tap. An air-operated plunger has been devised which will center the nuts in the crosswise direction, or position them properly under the tap. It ejects them after they have been tapped. Nuts are let into the tapping slide from an inclined slide set at right angles, the latter fed from a suitable hopper arrangement above. This speeds production to a high degree.

NUT PRODUCTION

Interesting are developments aimed to reduce costs on high-speed production of nuts. In the case of castellated nuts, hopper fed, conveyorized milling machines seem to be tops in high production.

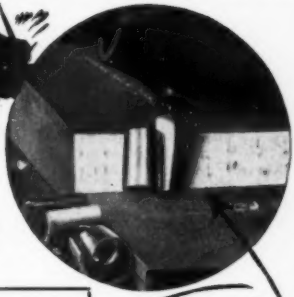
Some of these machines have been highly developed. They have 2 independent conveyors running continuously. A different sized nut can be handled on each conveyor, making it possible to slot out 2 sizes at once at high speed. Six cutters are milling constantly. Indexing is automatic. The machine automatically

There are other interesting methods in nut tapping production, one being a nut-tapping attachment for a screw machine, developed by a prominent screw machine manufacturer. The attachment is fastened to the machine over the front cross-slide. As soon as the part has been cut off at the main spindle, an arm carries it to an intermediate position, where a countersinking operation is performed on the back end. It is then transferred to the tapping unit, where the nut is placed in revolving chuck and automatically fed.

WHERE THE GOING IS TOUGH!

ON THE BATTLE FRONT OR IN THE SHOP—

EFFICIENCY COUNTS...



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Win in the Battle of Production

Use Gold Tip and Blue Nose Bits on tough jobs like this and watch results. SEND FOR CATALOG AND PRICES.

Specially treated to Rockwell "C" 62-65 and are not brittle.

Tru-Cut TOOL COMPANY

14236 Birwood, Detroit, Mich.

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LATHE MANDRELS... DOVETAILS
KEYWAY CUTTERS
FORM GROUND TOOLS

Actual photo of Tru-Cut Gold Tip Bit. 11/16" cut, .020 Feed, 1020 SAE Steel.

Off the Floor Deliveries!

ON

TRINDL SUPER INDUSTRIAL ARC WELDER

DESIGNED FOR HIGH SPEED PRODUCTION ARC WELDING

TRINDL SUPER INDUSTRIAL ARC WELDERS, the result of many years of careful engineering and "job tested" research, are rolling up impressive production records. Acclaimed for superior performance, ruggedness, dependability, and economical operation. For better, faster welding, easy-to-operate TRINDL SUPER INDUSTRIAL ARC WELDERS will help step up your production schedules 20% to 40%. Manufactured in a range of distinctive sizes to accommodate every type of shop and production welding job. Trindl Welders, Electrodes, supplies and accessories, available for immediate delivery, will save you both time and money.

Write, wire or phone for full details

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CHICAGO, ILL.

SCRAP

The word scrap is something of a misnomer when applied to the whole scrap drive. Salvage would be theoretically the choice, says Barber Coleman Co.'s "B. C.A. News." In no field is this more clearly illustrated than in the steel and tool industry, which differentiates very clearly between scrap and junk.

Junk consists of a miscellaneous assortment of scrap metal having unknown analysis and is absolutely worthless to a steel maker, though useful in other ways. Scrap is good clean steel of known analysis which, because of its physical size and shape, cannot be used for anything but remelting purposes.

For example, if a circle is cut from a square plate there will remain four corners which may be useless for further manufacture. However, the metal in these corners is exactly the same quality as the center which was used, and when a sufficient quantity of this scrap—all of the same analysis has been accumulated—it becomes valuable melting stock for the steel maker. Actually, steel which has been twice melted has the opportunity to become even better than steel made entirely from raw materials, and it has been established that better high speed steel will result if a portion of the charge is made up of scrap, says B.C.A. News.

High speed steel scrap is also important because of its tungsten content which can be reclaimed no matter whether the steel is in a solid form such as broken cutters or ends of bars, whether it is in turnings produced in the machine operations, whether sawdust from the cutting-off saws, or whether in fine particles of emery removed by either wet or dry grinding.

This type of scrap is called production scrap. Some of these forms are easy to gather and handle; some of them such as dust from an emery wheel are problems, yet the segregation of scrap by kind and analysis is now being undertaken on an unprecedented scale. The basic principle is segregation at the source which guarantees scrap free from contamination.

Cleveland Planer equipped with Westinghouse Variable Voltage Drive

with ROTOTROL and Westinghouse VARIABLE VOLTAGE DRIVES!

Faster cuts—faster return! Westinghouse Variable Voltage Drives speed up nonproductive return strokes, give more cutting strokes per minute. ROTOTROL—versatile Westinghouse control—gives faster acceleration and deceleration, provides closely regulated d-c power, regardless of load, over entire speed range (40 to 1200 planer motor rpm). Table can be stopped and reversed at precise same point every time.

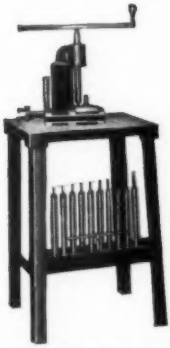
Fewer relays, contactors and electrical operations per stroke reduce need for maintenance and time out, too. Get full details . . . write Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa. J-21209

Westinghouse

VARIABLE VOLTAGE DRIVES

SLASH

DIRECT HAND TAPPING
LABOR COSTS 75%



It cuts hand tapping labor costs 75% in tool and die rooms and machine shops. Makes quick accurate tapping easy. Assures holes tapped at right angles without the aid of a square.

Does away entirely with tap breakage, spoiled work and consequent delays. Ready instantly for any hand tapping job from No. 5 to ¾" tap.

Ask for Circular No. 51 for details.

Manufacturers of Producto Die Sets

THE PRODUCTO MACHINE CO.
BRIDGEPORT, CONN. DETROIT, MICH.

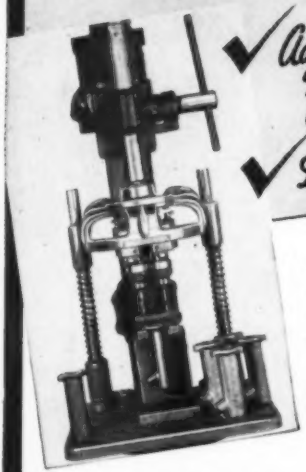
DARNELL CASTERS

You are sure to find the exact caster or wheel for your individual requirements in the Darnell line.

DARNELL CORP. LTD.,
LONG BEACH, CALIFORNIA.
60 WALKER ST., NEW YORK, N.Y.
36 N. CLINTON, CHICAGO, ILL.

TWO SPINDLE *Adjustable* DRILL HEADS

Drill Two Holes At Once



✓ *Adjustable Centers from ½" to 6"*

✓ *Drill Capacity 0 to 5/8"*

Sleeve and overarm types . . . in several sizes. Will double output of any single spindle drill press.

Quickly adjusted to desired drill centers from ½" to 6".

Send for bulletin.

LINDERME MACHINE & TOOL CO., INC.

12253 COYLE AVE., DETROIT, MICH.

A-C WELDING

The use of alternating-current arc welding should be extended as far as possible in these times of critical shortages of material, power, and time, according to C. I. MacGuffie, manager of sales of G-E arc-welding equipment, writing in General Electric Review.

Critical materials such as copper and electric sheet steel are saved through the use of arc welders, since approximately twice as much welding capacity can be built into transformers as can be built into rotating machines, with a given amount of these materials.

By switching to a-c welders where possible, hard-to-get d-c welding equipment can be released for fabrication work where d-c welding may be essential.

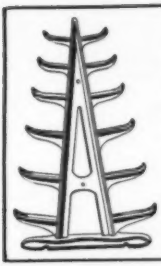
A-c welding equipment steps up production and produces welds of higher quality by the virtual elimination of magnetic blowing of the arc, making it possible to use larger electrodes and higher current than are practical with direct-current welders, particularly in work having many corners.

One of the most important savings accruing from the use of a-c welding equipment is the saving in electrodes. With electrode consumption estimated at 500,000,000 lb. this year, every effort must be made to curtail waste.

One shop obtained a 20 per cent reduction in the amount of electrodes used when they changed from d-c to a-c welders, largely because it was possible to use larger electrodes at heavier currents when arc blow was eliminated.

PROTECTIVE CLOTHING

The Strauss Co. 887 Ewart Bldg., 925 Liberty Ave., Pittsburgh, Pa., offers Bulletin 143, describing their line of head and body protection for men and women industrial workers. The literature includes "protector" helmets for both men and women, welders' helmets, rain and storm capes and a new line of safety hats and breast protectors for factory women.



"CHAMPION" Steel Racks

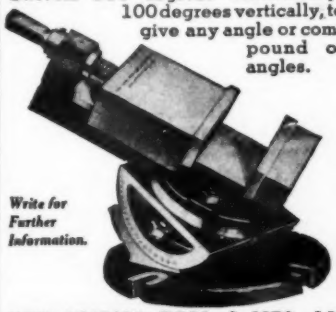
Save time, steps and money by keeping bar stock, shafting and pipe out of the way and off the floor.

Write for full details.

The Western Tool & Mfg. Co.
Springfield, Ohio

New Britain UNIVERSAL VISE

Swivels 360 degrees horizontally, 100 degrees vertically, to give any angle or compound of angles.



Write for Further Information.

NEW BRITAIN TOOL & MFG. CO.
NEW BRITAIN, CONN., U. S. A.

TURRET TOOL POST

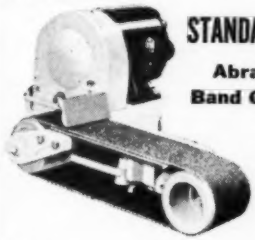
Hardened throughout, self-compensating for wear, precision built. For top production on small South Bend, Sheldon, Clausing, Atlas, Logan and similar bench lathes and small screw machines.

F & M SALES COMPANY, HOLLYWOOD, CALIF.
Manufacturers and Selling Agents

SPEED YOUR GRINDING

DUPLEX M-6
BAND AND DISC GRINDER

The latest in pedestal type grinders. Actually two machines in one! 14" disc for all rough work . . . 6 x 48" band for finishing. Precision-built to meet war-time production standards—quickly, economically!



STANDARD D-4
Abrasive Band Grinder

This new, streamlined bench type grinder assures fast, quality finishing on metals, plastics, wood, fibre . . . at low cost. Built to machine tool specifications. Standard D-4 is equipped with improved band tension control and specially designed protective motor hood. 4 x 36¼" band. The ideal portable unit.

OTHER STYLES AND SIZES IN NEW BOOKLET ON FINISHING—WRITE TODAY

WALLS SALES CORP.
96 Warren St., New York, N. Y.

MORE POWER LESS WEIGHT

Power a-plenty in ARO Pneumatic Tools for many small tool jobs—yet ARO Engineering has packed this power into a surprisingly small unit.

In drilling, nut-setting, screwdriving, grinding, sanding and similar operations formerly requiring larger tools, ARO sets a new standard of *greater production with less fatigue.*

Simple in design...Rugged... Dependable...Stall-proof...Light in weight. Send for new catalog.

THE ARO EQUIPMENT CORPORATION
BRYAN, OHIO

ARO
PNEUMATIC TOOLS

COLOR

Colors are usually employed because of their aesthetic appeal. They have practical values also. One of these values concerns identification. Modern plants often have ceilings and walls that are almost a network of air lines, steam lines, water lines, etc. Even the most experienced maintenance man may have difficulty tracing one specific line through the maze. Certainly he will not be able to identify it at a glance, unless he traces it from the source. By painting these different pipe lines in different colors, trouble in tracing is eliminated.

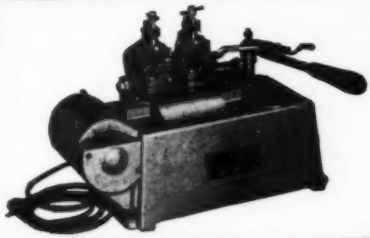
Use of colors identifying lineal materials, stored in random lengths in the same rack, and accessible only from the ends, has saved much time. Using certain lengths as standard, as for instance in 2-foot increments, one color may be used for 10 ft., another for 12, another for 14, etc. Colors may be chalked or painted on the ends of the stock when being racked.

Color can be used to advantage by inspectors, with reference to convenient marking of pieces passed, and of rejects, fully and clearly to differentiate one from the other. In some places and cases, different colors of tags or labels may prove better adapted to ready identification than crayons, and in such cases, the most flashy and attention-drawing colors should be used in the most important places.

The idea of color for identification has even extended to milling machine practice, with reference to arbor spacers. Here, a manufacturer of arbor spacers, making them from plastic, gets different-thickness spacers out of different colors of plastic, each color denoting a certain thickness. Then again color has been used to mark different types of cutting tools.

Color has proved a great aid in modern management, as a time-saver, as well as preventive of mistakes, accidents, etc., which make for waste and needless inefficiency in production.

It's adaptation is, therefore, becoming more widespread, from day to day.



BAND SAW WELDERS

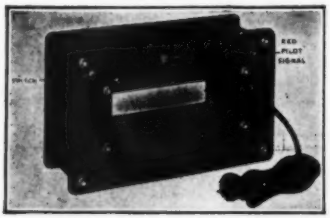
The No. 141 Bench Type Metal Working Band Saw Welder is available with or without grinder. Work can be annealed without removing from the Welder. Band saws up to ¾" wide may be welded.

1 KVA—110 Volt—60 Cycle—single phase—5 point heat control—1 point anneal heat—Weight 40 lbs. Let us send you further details.

Mfrs. of complete line of Spot, Butt, Seam, Flash, Projection and Special Welders.

WELDEX INC., 7325 McDONALD AVE., DETROIT, MICH.

AMC DEMAGNETIZER
A TOOL ROOM NECESSITY

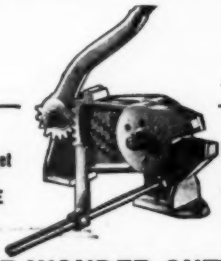


Every tool room needs this simple, portable, sturdy demagnetizer. Small parts passed through the powerful AMC field are instantly demagnetized. Large, flat surfaces can be demagnetized by sliding the device over the surface.

Price is only $32.50, complete as shown.

Write for full information.

ALOFS MFG. CO., Grand Rapids, Mich.



A Midget in SIZE ★

A GIANT for WORK! ★

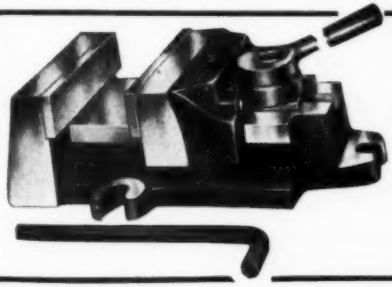
THE WONDER CUTTER

Cuts wire, rods or band iron easily and quickly. Any size wire or rod up to ⅝ inch round or ⅝ inch square and band iron up to ⅛ by 2 inches. Its small size and low price makes it possible to have more than one, mounted wherever convenient. Gauge can be set for repeated cuts of same length on both wire or band iron.

Write for further information and prices.

The Federal Foundry & Supply Co.

4602 East 71st St., Cleveland, Ohio



PLUNKET QUICK ACTION VISE
for DRILL PRESS OR MILLING MACHINE

Designed for production work, using an eccentric motion to apply pressure to jaws. Eccentric motion moves jaw 5/16".

Size	Net Price
6" jaws, 1½" deep, opens 4"	$38.50

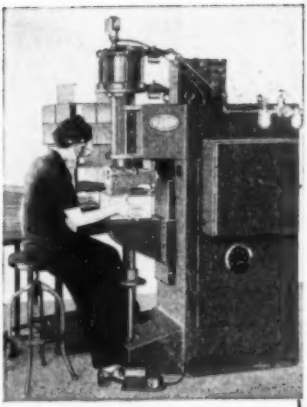
Pressure between jaws, with handle furnished, 2200 lbs. Net weight 36 lbs.

Our complete line includes Vises for Drill Presses, Milling Machines, Shapers, Grinders

WRITE FOR CATALOG

J. E. Plunket Machine Co., 1823 W. Lake St., CHICAGO, ILL.

The New
PEER
P-100
HIGH SPEED
WELDER



NEW PRESS-TYPE WELDERS

Maintain High Production With Women Operators

Designed for both general spot resistance and projection welding, the new automatic air-operated PEER Press-type Welders are meeting the production requirements on vital war material jobs.

These rugged, versatile, high speed production tools are adaptable to a wide range of uses — saving time, increasing production and insuring uniformity. Being automatic, little effort on the part of the operator is required.

You, too, can speed up the daily production of sheet and structural steel, wire, rod and non-ferrous metal assemblies with these most recent additions to our electric welder line. Write today for Bulletin 50C.

PIER EQUIPMENT MFG. CO., 1472 Milton St., Benton Harbor, Mich.

PEER

ACE SPOT WELDERS

Write for Bulletin 50C.

Cold forging has made some very interesting things possible. How about taking a roll of wire, running it through a machine which has 5 work stations, and producing double-chamfered, centrally-pierced nut blanks? All of the cutting, forming or forging, and piercing equipment necessary is included right in this one machine. This has been done. The builder has also provided a horizontal wire reel for handling heavy wire coils, it being possible for one man to load a 600-pound coil of wire.

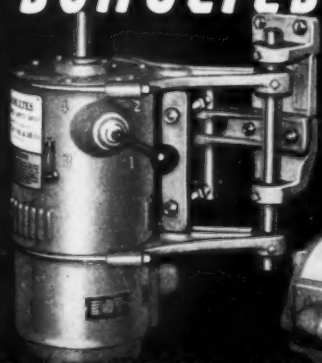
You will appreciate that the efficiency of a forging operation may well be gaged by the amount of after-forging work necessary to finish the job. When you have excessive flash, eccentric upsets or enlarged shanks to deal with after the forging operation, there is little hope of cleaning up the work in reasonable time. One line of forging machines for forming ends of automobile pinion shafts, has shown remarkable records in producing uniformity and accuracy in forged work. One end of the shafts mentioned was formed at a single heat, with 2 blows by a 2-operation die.

FORGING

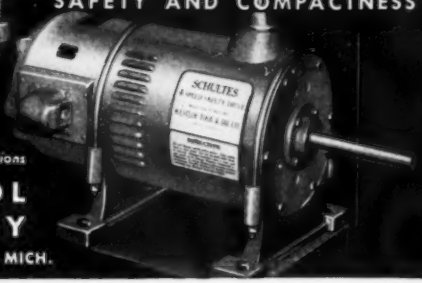
Methods of forging have always held interest for mechanics, due to the importance of this operation in the metal-working industry. Forging-type presses hold a place of considerable importance from this angle, and it is quite often, the case that manufacturers of relatively full lines of presses for various purposes include some good forging presses. Recently one was used for forming noses on 155 mm. shells. At the time of handling on this press, the projectile is about 5" at its greatest diameter, and around 18" long.

Forging hammers, so-called, are of great utility where especial flexibility in operation is desired. One line of hammers may be operated either mechanically or electrically, with an adjustment provided for different thicknesses of dies.

"SCHULTES"... The King of Motor Drives!



ALL HELICAL GEARED, UNSURPASSED IN POWER, EFFICIENCY, SAFETY AND COMPACTNESS



Write for Complete Detailed Specifications

WESTLOF TOOL & DIE COMPANY

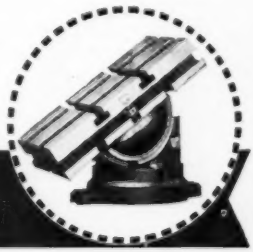
4192 BELLEVUE AVE. • DETROIT, MICH.

SAVE TIME ON INTRICATE ANGULAR SET-UPS . . .

MULTI-SWIVEL VISE

Fully universal . . . three swivels simplify the setting of compound angles. Parts interchangeable . . . can be used as a plain flanged vise, a swivel vise or multi-swivel vise.

The Platen greatly increases the capacity of the unit. Vise and Platen are interchangeable.

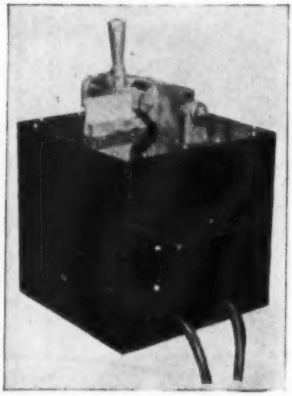


WRITE FOR INFORMATION

MASTER TOOL CO.

161 HIGH STREET • BOSTON, MASS.

A. C. F. Soldering Transformer



The No. 1 one-electrode a. c. f. Special Soldering Heater illustrated is enclosed in a box which is a 9 inch cube and weighs about 70 lbs. It is operated by a treadle resting on the floor.

Optical manufacturers use this heater to silver solder cross-pieces to frames of glasses, and also to butt-weld the two pieces of metal that make the bows. It is also being used for soldering work on safety goggles.

They are also used in plants of commercial diamond manufacturers, to heat the prongs of the steel holders prior to insertion of the diamonds.

A manufacturer of airplane engine thermometers used this equipment to silver solder the brass cases holding the thermometers.

Using this transformer, both hands of the operator are free, because of the foot control. It is said to be especially adaptable where lower melting solders are used and is made by American Car & Foundry Co., 30 Church St., New York City.

Carbide Tool Conservation

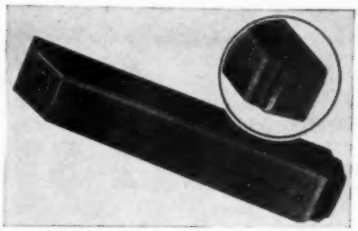
A jumbo size wall poster measuring 48 x 27 inches shows graphically 4 simple ways to get longer life from cemented carbide tools and is illustrated in red, white and blue.

The poster is in accordance with the War Production Board's expressed request for simple and visual educational posters to be of assistance to workers in defense industries.

Copies will be sent free on request addressed to Vascoloy-Ramet Corp., North Chicago, Ill. It carries no advertising except a logotype.

Acid-Resistant Stamp

Made of new "S-22" Synthetic, said to be unaffected by acid etching inks, a new stamp is announced by Jas. H. Mathews & Co., 3942 Forbes St., Pittsburgh. Unlike rubber and other materials usually employed, "S-22", says the firm, does not disintegrate thru use with acid inks. According to the maker's own tests, stamps made of the synthetic outlast ordinary rubber stamps from three to four times.



New bulletin S-Catalog 146 gives complete information on this as well as a wide variety of stamping equipment made by the manufacturer.

Perfex Gage Bulletin

In an attractive new bulletin illustrating typical examples of its gage line, Perfex Gage & Tool Co., announces the completion of a new plant at 3603 Gaylord Ave., Detroit. This modern plant was built expressly for the manufacture of gauges and features air conditioned lap and inspection rooms that are kept at temperatures between 68 and 70 F.

"Blackout" designed windows are also featured.

Many Times Greater Die Life by using DIES of WILLEY'S METAL

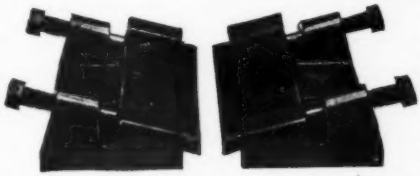
When you change from steel dies to WILLEY'S DIES, as illustrated, production goes up - costs go down. In the vital production of small arms ammunition and cartridge cases, Willey's Dies are proving their worth in many war production plants.

Catalog on request.

WILLEY'S CARBIDE TOOL CO.

1340 W. Vernor Highway. Detroit, Michigan

HART'S Divided Machine Vises



These Vises will hold work the full length of the table, if necessary. Useful on planer, milling machine, surface grinder or drill. They adapt themselves to any shape and can be used on sides of table as well as ends. The jaws are tool steel and hardened, the angle holding the work down on the table.

HART'S Milling Fixtures

These fixtures will make themselves popular and profitable in your shop. Easily kept clean to receive the work. May be used in either horizontal or vertical position. Suitable to hold round, hexagonal, octagonal, or square stock, aligning the work with the machine. Grip holds the work on the bottom as well as on the back. Shipped in pairs, unless otherwise ordered. Made in 4 sizes—¾" to 4".

HART MACHINE CO.

26 MATHER ST., DORCHESTER, BOSTON, MASS.

When writing for descriptive circular kindly mention the BLUE BOOK.

FINE FINISHING

Better appreciation of the benefits of fine finishing, polishing and grinding, has led to exercise of greater effort along this line. There was a day when benefits of extra care were limited to appearance. Now it is known that there may be reduced fatigue resistance if a tool mark is allowed to remain on the surface of certain parts.

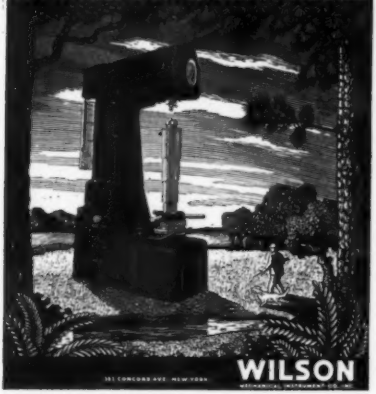
One development in polishing, pre-polishing and finishing of metals is use of soft rubber-bonded abrasives.

Under the stresses often occasioned by thrust, abrasive grains recede into the rubber bond, thus not obtaining a large or harsh "bite" at the metal. Such material may be had in wheels, sticks, tablets and special shapes, and may be used in various kinds of grinding and polishing equipment. Other firms, specializing particularly in wheels and points of rubberized abrasive, have gone so far as to offer free samples, so sure are they of acceptance of their product, where fairly tried.

However, rubberized abrasives are not the entire fine-finishing picture. Some firms have made special studies of superfinishing. As a result of protracted study and experience, they have developed stones and wheels in imposing array. When one has such problems to be solved, it is certainly better to tap the research experience of such a firm, than to depend upon a surmise of one's own, no matter how promising it may seem.

In addition to the proposition of greater resistance to fatigue, we must consider superfinished parts as having greater resistance with regard to wear. Finishes on bearings, cylinders, pistons and cams, to put it in the language of an authority on this subject, are made "so nearly perfect that such parts are made practically wear-proof." To obtain such finishes, abrasives used are, naturally, all-important. Extremely fine-grit wheels are used as supplied by abrasive specialists.

LIKE HUNTING DOGS WITH THEIR MASTERS OUR ROCKWELL HARDNESS TESTERS HAVE GONE AFIELD WITH THE MEN IN METALLURGICAL AND MECHANICAL SEARCHES FOR IMPROVED PROPERTIES IN METALS



WILSON

MOREY *Designed and Built* FOR *Precision* PLUS *Production*

VERTICAL SHAPERS 8"–12"–14" STROKES

Four cutting Speeds . . . infinite feed variations quickly selected . . . Directional control for all movements . . . Rapid power movements in all directions . . . Brake for Ram automatically applied . . . OPERATOR CONTROLS MACHINE WITHOUT MOVING FROM HIS WORKING POSITION . . . Timken Bearings for Bull Gear, Shaft and Rotary Table . . .

ACCURATE, POWERFUL, FAST, FINGERTIP CONTROL

Ask for Circular No. 720A

MOREY MACHINERY CO., INC
410 Broome Street New York, N. Y.

A USEFUL ADDITION

Modern precision machine shops and inspection departments will find this sturdy 36"x 48" MILWAUKEE SURFACE PLATE a valuable addition. Constructed of semi-steel, accurately machined, securely mounted on cast legs which are machined and provided with SAE adjusting screws for perfect alignment. Height from floor to top of plate 30". Can also be had in 38". Shipping weight 1200 lbs.

We also manufacture angles and parallels as shown underneath surface plate.

We also make larger and smaller plates either with planed or scraped surfaces, whichever is desired. *Write today for full information.*

J. C. BUSCH COMPANY ENGINEERS AND MACHINISTS SINCE 1907
165 SO. BARCLAY ST., MILWAUKEE, WIS.

GUARD EMPLOYEE HEALTH by installing Ruemelin Fume Collectors wherever welding operations take place. They remove noxious gases, heat and smoke at the source . . . eliminate employee fatigue . . . speed up welding operations. Especially valuable in winter when doors and windows must be closed. Hundreds in operation all over the country. Write for bulletin No. 37-C.

RUEMELIN MFG. CO., 3980 N. Palmer St., Milwaukee, Wis.

RUEMELIN FUME COLLECTOR

SHEARING

Lever-operated shears of small size, mounted on a bench in a convenient place, often save much production time at the machine. They enable the bench man to get out a moderate number of pieces of small-section stock or narrow strips, without interfering with larger equipment. Some shears of this kind available offer many improvements over those of earlier days.

It is interesting to observe to what large extent small portable shears are being used in sheet metal departments. Smaller electrics have reciprocating cutters narrow enough to offer no resistance to turning, for they will not bind in the cut. One such, fitted with alloy steel cutters, will cut faster than 6 ft. per minute on 14 gage sheet steel. It follows lines drawn to short-radius curves, or straight. Fourteen gage steel is the heaviest for which this shear has capacity. It will handle 16 gage stainless steel sheet.

Another portable shear of somewhat similar design handles 12 gage hot rolled steel at a lineal rate of around 15 fpm. It also follows readily on straight or curved lines, and leaves smooth clean edges at the cut. Somewhat heavier and stationary models based on much the same design handle 10 gage sheet. Such equipment is a great help where much sheet material is cut to various forms.

Out on the production line, shearing large and heavy work, a different proposition is in hand. For squaring and close cutting of large sheets of metal, and doing it quickly, modern power squaring shears are the answer. You would be surprised at the cutting accuracy possible on some of these machines. Gages can be quickly set, and are self-measuring in increments of 1/128 inch. They cut narrow strips without distortion, and the cutting line is fully visible.

They are extensively used in war work.

Size of the work usually determines sizes of shears. Some makers who specialize in building such shears, can supply them in a complete range of sizes up to 20-ft. cutting lengths. And there is little reason to doubt that larger sizes can be made to specifications.

Guard Against Grief by Testing Your Springs!

If the metal shortage has necessitated a change in your spring-wire analysis, the chances are that your present springs have qualities quite different from those which you were using in the past. And if the springs are not right, there will be faulty functioning of the product of which they are a part.

This is why spring-testing is more important today than ever before. It is also the reason why more and more manufacturers throughout the nation are bringing to us their spring-testing problems.

LINK SPRING TESTERS

Write for Circular 103

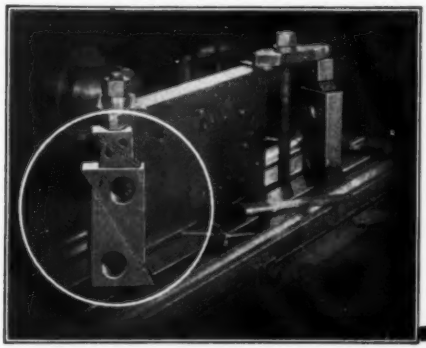
Hand-operated instruments for service, laboratory and inspection. Also motor-driven instruments for production testing.

LINK ENGINEERING CO.

13843 ELMIRA DETROIT, MICH.

Interchangeable SURE GRIP STEP BLOCKS

WILL SAVE YOU TIME LOOKING FOR BLOCKS THE RIGHT HEIGHT

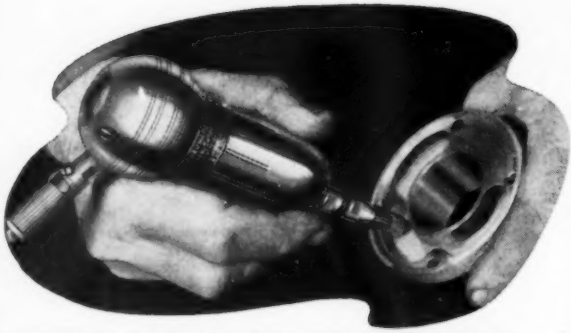


May be used on Millers, Slotters, Jig-Borers, Lathes, Drill Presses and any place you have to hold your work down with clamps.

For quick set ups, have your tool room, machine and production departments well equipped with all sizes. We have received hundreds of comments from satisfied users on the practicability of these blocks and what great time savers they have been. Write for folder giving complete details concerning these useful blocks.

TIETZMANN ENGINEERING CO.

MAIN STREET ENGLEWOOD, OHIO



75,000 R.P.M.

TO MAKE SHORT WORK OF TOUGH JOBS

Even hardened die and tool steels are cut like soft metal with this Onsrud B-1 Air Turbine Grinder. Weighing only 12 oz., its 1/6 H.P. at 75,000 R.P.M. literally sweeps away excess metal. Cooled by exhaust air and practically vibrationless, the B-1 makes for fast, easy tool and die workmanship.

Get complete specifications on this versatile, efficient tool by writing today to the

ONSRUD MACHINE WORKS, INC.
3908 Palmer Street Chicago, Illinois, U.S.A.
Sales Offices in All Principal Cities

Onsrud MACHINE TOOLS AND METHODS FOR TOMORROW'S PRODUCTION

HOLE CUTTERS

In cutting holes from solid material, too large to be conveniently handled by an ordinary drilling process, various hole-cutting tools are used. Some are of the general nature of a cup type saw, the teeth on one edge of the cup, and often referred to as hole saws. Most of them have distinct limitations as to depth of cut they will make, but they cut any material that a hacksaw blade cuts. One line of hole saws widely used with slow-speed, portable drills, cutting installation holes in control boards, cuts through material ¼" thick. It may be had in diameters varying from ¾ to 3½". Ballbearing housings may be installed in plate assemblies with a hole saw. A hole is cut through the plate, and a flanged cup is welded or otherwise attached to one side of the hole, to provide bearing housing.

Holes saws are often used for passing pipe or shafting through obstructions. Blower fan housings, tanks, bins and similar equipment are cases in point. In the case of tanks, value of the hole saw for cutting inlet and outlet holes, to which pipe will be attached is self-evident. It is used for pipe joinery, cutting a hole in one pipe where another pipe is to be welded. It is also used for passing smaller pipe through larger, when need arises in pipe construction, as in rack building, etc. One manufacturer of hole saws makes these units with replaceable blades. When one blade becomes too badly worn, it is simply discarded and replaced with another. This firm provides 3 different widths of blades, one especially adapted to cutting holes in pipe or other curved surfaces. These hole saws are practically always fitted with a drill at the center, to start the cut and give center support.

There is a type of hole cutter guided by a pilot, entered into a previously drilled hole. It has 3 cutting blades, and is adjustable for size, anywhere between ¾ and 4½".

This tool is said to be a valuable adjunct in time-saving on war-production jobs, in many plants.

PYRO THE SIMPLIFIED OPTICAL PYROMETER

Unique construction enables operators to rapidly determine temperature even on minute spots, fast moving objects or the smallest streams; no correction charts, no accessories, no upkeep.

THE PYROMETER INSTRUMENT CO.
102-105 Lafayette St., New York, N. Y.

HARGRAVE
CLAMPS
For Every Purpose

Individually tested for strength and freedom from flaws, assuring longer service. Preferred by industry since 1879.

FORGED STEEL
QUICK ACTING
DEEP REACH
WELDERS

In sizes from ¾" to 10" opening. ½" to 16" deep.

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Ask your supply house

The Cincinnati Tool Co.
1945 Waverly Ave. Cincinnati, Ohio

WE INVITE YOU TO TRY

CRATEX
WHEELS AND POINTS

The World's Best Rubberized abrasives for Fine Grinding and Polishing

Attach this advertisement to your card or letterhead. We will send you a *free* trial sample. Or if you prefer send $1.00 for Special 33 wheel assortment.

CRATEX MFG. CO., 81 Natoma St., San Francisco, Calif.

NOW
Speed up **PRODUCTION**
WITH FAMCO PRESSES

This Famco Arbor Press is flaring insulation on armature cores of Dumore Aeromotors...another example of how Famco Presses speed production in America's war plants. Only Famco Arbor Presses have adjustable gibs for perfect ram alignment. ***40 stock sizes and models,*** floor and bench types. ½ to 15 tons pressure.

Write for complete facts on the full line of Famco Arbor and Foot Presses.

Famco Machine Co.
1320–18th St.
Racine, Wis.

Floor Arbor Press

No. 15 Foot Press

famco
FOOT AND ARBOR
PRESSES

STRAIGHTENING

Straightening operations on items of relatively large cross-section usually involve some type of press, with which both the location and amount of pressure may be controlled. For a long while, there have been special hydraulic presses made for straightening axles, shafting, etc.

These machines are made of a pair of very heavy I-beams forming the bed of the press, with 2 bending blocks adjustable to any position on this bed, and a pressure frame, carrying a hydraulic ram. Frame can also be moved to any required point along the bed. Ram is in alignment with centers of bending blocks at all times, regardless of travel of either or both. Press has sufficient bending power to straighten 6" shafting. In addition to facilities mentioned, the press carries head and tail stocks on the same bed, at the right and left of bending blocks. Thus, the unit may be conveniently tried for truth as straightening proceeds.

Straightening heavy crankshafts is a more ticklish problem in most cases. Remarkable about the way it is handled in some places, is close control of hydraulic ram pressure used. It is said such work requires a delicate touch. Often the "delicate" touch must be measured in tons. One hydraulic press used for this work has a sensitive pressure control with which operator may obtain desired ram pressures, from a few pounds to full capacity of 35 tons. This crankshaft job is only one of many, performed to advantage on the hydraulic press.

There are jobs of straightening that are not hydraulic press jobs. In many different cases, wire of different gages is taken from rolls, straightened and cut to standard lengths by machines especially designed for this purpose. Models of such machines are available for round or flat wire.

In PRODUCTION and COMBAT alike
GITS OILERS
are providing one of the most essential requisites of mechanized warfare, that of positive lubrication under extreme conditions. Every lubricator in this line is designed to a specific need. The Gits Line offers a dependable answer to every lubricating problem, large or small.
Write for CATALOG No. 60
GITS BROS. MFG. CO.
1860 South Kilbourn Avenue • Chicago, Illinois
30 years of oil cup experience

CAST IRON UNIT HEATERS.—A description of the "Grid" Cast Iron Unit Heaters, introduced in 1942 as a substitute for aluminum heating sections to cooperate with the war effort, is contained in a catalog sheet, just off the press, offered by D. J. Murray Mfg. Co., Wausau, Wis.

What Do YOU Know About Work Expedition?

There are many ways to use cotton bags in speeding up both shipping and production. Why not investigate their possibilities? Send for FREE reprint: "Cotton Bags in Work Expedition" and for FREE samples. Bags shown here save a lot of time and money in ordinary shipping, too.

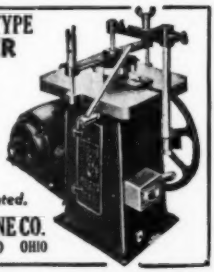
THE AMES BAG CO.
1971 EAST 66TH STREET • CLEVELAND, OHIO

BROACH TYPE KEYSEATER

The Reading Bench Machine does not require bushings or guides. No other machine like it.

Very fast Capacity from ¼ to ⅝ cutter. Low first cost... prompt delivery.

Good dealers wanted.



READING MACHINE CO.
READING (CINCINNATI) OHIO

Save TIME and MONEY

WITH THE

"BLANER" Universal Hand SPRING WINDER

Every shop and tool room needs it . . . a strong, dependable unit . . . quickly set up in any vise.

Increases production of hundreds of sizes of springs.

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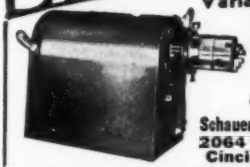
THE JOHN BLANER COMPANY
Corner Meek & Elm Sts.
SHARON PENNSYLVANIA

SCHAUER Speed Lathes

Variable Speed



Ideal for lapping filing, polishing small metal and plastic parts.

Write for Catalog 420.

Schauer Machine Co.
2064 Reading Rd.
Cincinnati, Ohio

Good DIAMOND TOOLS *Cost Less*

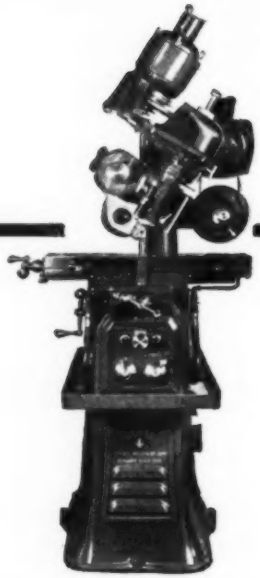
Stock dressers, special dressers, and resetting are sent 24 hours after receipt of order.

GRINDING WHEEL DRESSERS • PHONOPOINTS • SHAPED TOOLS
THREAD GRINDERS • DIAMOND POWDER

Set in Our Own **PERM-ALLOY** (Reg. App. for)

Failure of diamond tools is costly. Karelsen's are reliable . expertly constructed for precision, and fully guaranteed to give economical service. Send sketch, blueprint, or specifications.

EST. 1852 **E. KARELSEN, INC.** 56 WEST 45th STREET NEW YORK, N.Y.



NO OTHER MILLER HAS ALL THESE FEATURES

1. Hydraulic Feed. **2.** Hand Feed. **3.** Vertical and Angle Spindle. **4.** Horizontal Spindle. **5.** 3 High Spindle Speeds. **6.** 3 Low Spindle Speeds. **7.** Revolving Turret. **8.** 16" Vertical Travel. **9.** 16" Longitudinal Travel. **10.** 8½" Cross Travel.

Entire tolerances held to less than .001

ARMOR UNIVERSAL TURRET MILL

AIRCRAFT MACHINERY CORPORATION
BURBANK, CALIFORNIA

similar wrenches. One firm making these wrenches has them fitted with a double scale visible from all working angles, and have avoided use of fragile mechanisms in design.

Another, to make the indicators more easily read, furnishes wrenches in 4 different calibration ranges. They allow spacing dial gage graduations more widely, making them larger and consequently more legible. The dials are so mounted on these tools as to give them good protection against knocks and bumps.

One manufacturer of a large line of wrenches, who makes torque reading tools, has a type of socket wrench, suitable for use with interchangeable wrench sockets, which snap into place and lock. This is a highly valuable feature, since the wrench cannot become separated from the socket, when one is not expecting it. With a "brace-type" or quick-action wrench of this kind, machine operators quickly loosen and tighten nuts on work fixtures, such as at milling machines, with minimum loss of time.

Universal and ratchet wrenches, so convenient in so many places, are featured by another outstanding wrench manufacturer making drop-forged tools. Speed and safety are natural advantages of the socket type wrench, and this builder has gone the limit in both directions, developing a large number of handles and wrench accessories.

SPECIAL WRENCHES

The dangers in pulling nuts up too tightly have long been known. Some men have a flair for doing that very thing. Others, realizing the danger, develop timidity in putting enough power on the wrench to tighten a nut.

To get away from these troubles, the so-called torque wrench has come into being. It has an indicating device allowing one to see how much torque he is applying. Given standards may be set, and inspectors may check the torque with

DIAMOND ACME TOOLS

Diamonds vary in quality and it is important to use the proper kind for a given job. "Bargain diamonds" are not an economy.

If you don't know diamonds know your diamond dealer. Our 45 years in this field merits your confidence.

ACME DIAMOND TOOL CO.
15 MAIDEN LANE, NEW YORK, N. Y.

HAMILTON
SWISS TYPE
GEAR HOBBERS

. . . for Accuracy and speed in hobbing PINIONS GEARS and SECTORS

TWO MODELS

No. 00 SPUR GEAR HOBBER (Illustrated) for work up to 2" diam.

No. 1 SPUR and SPIRAL GEAR HOBBER for work up to 6" diam.

Write for further details to

TRIPLEX MACHINE TOOL CORP.
Exclusive Sales Agents
125 Barclay St. New York, N. Y.

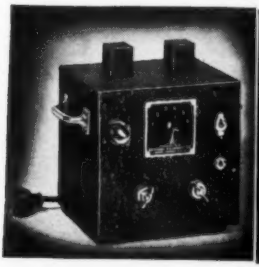
Manufactured by
The Hamilton Tool Co. Hamilton, Ohio

RECLINABLE POWER PRESSES

We manufacture a complete line of mechanical power presses, with sizes and types for every need in your shop.

Write for bulletins.

ZEH & HAHNEMANN CO.
Newark, New Jersey



Red "E" DEMAGNETIZERS & ETCHERS FOR SPEED AND ECONOMY

A sturdy all around unit for any shop. Demagnetizes by throwing lower switch and passing work over magnetic poles at top of unit. Etching is controlled at upper switch with convenient six station selector to adjust depth of etch.

Red indicator light signals when unit is in operation. Rubber extension cord, plug, special alloy etching stylus with self cooling holder are included. *Write for folder giving details.*

GRINDING MACHINE CO.
2832 E. GRAND BLVD. DETROIT, MICH.

Keep Your Surface Plates Accurate

Lombard re-scraping makes your old Surface Plates as good — and often times better-than new. All of the facilities which have made Lombard inspection plates a symbol for accuracy are now available for re-scraping, and machining old Surface Plates. This includes heat treating when necessary and essential hand work. Prices are reasonable and costs at a minimum. Prompt delivery.

LOMBARD GOVERNOR CORPORATION
400 MAIN ST. ASHLAND MASS. U. S. A.

KEYWAYS AND KEY SEATS

Various methods of keyway and key seat layout are available. A scriber held in a surface gage may readily be used when a shaft is held in V-blocks parallel to a surface plate. But there are simpler tools designed to facilitate layout of parallel lines on shafts.

One is a so-called key-seat clamp. In effect, it is a small metal leg fitted with a slot and a clamp screw of knurled finger type at the top. It allows ready attachment to either rule, straight edge, or blade of a combination square. With the leg bearing against the side of the piece of shafting, and the straight edge lying along it, a line is scribed. Then the leg-straight-edge assembly is simply rotated around the shaft far enough to scribe a parallel line to mark proper width of keyway for the shaft. Another simple device for the purpose is called a key seat rule. It is a rule similar in form to a length of light angle iron, bent to 90 degrees, L-shaped, on section. Laying this rule down on a piece of round shafting, it assumes a direction parallel to the axis, so that a line may be scribed along one edge. Both edges are beveled down to present a thin edge where they contact the shaft.

While keyways may often be cut on the shaper, it is better to have a keyseating machine. Some are made in stationary and relatively heavy models, especially good for handling heavy units. Others are of bench type, readily moved to the job. Either type represents a considerable saving in time against more cumbersome methods.

Do you know that there are special keyseating, units adapted for milling keyways anywhere along a piece of installed shafting, as well as on ends or more accessible places?

Units clamp in place on shaft at desired points, and may be had in a number of sizes, for hand or motor drive.

They save time on erection, alteration and repairs.

* * * * *

Buy a share in America with United States War Savings Bonds and Stamps

* * * * *

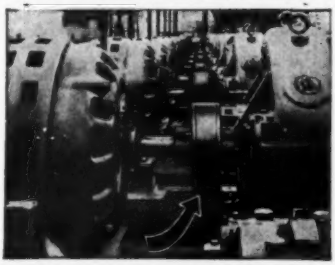
USE KANTI-LEVER COUPLINGS

THEY HELP YOU Maintain Peak Production

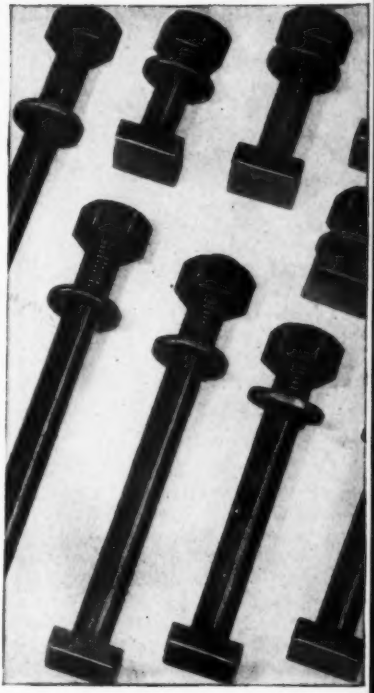
With your machines now forced to the limit to gain peak output, the necessity of stopping for repairs becomes much greater. You can prevent many of these costly interruptions of production by using KANTI-LEVER Couplings, for they have a scientifically designed Cushion Torque that absorbs sudden load shock and torsional vibration—the two main causes of wear fatigue and failure of machinery. The KANTI-LEVER is different from any other type and gives your machine a protection that is vitally needed under present abnormal conditions. See cut showing 70 KANTI-LEVERS that have proved invaluable to their user by protecting the driven machines and enabling steady production for over 18 years.

Send for Bulletin No. 28-B Describing

Kanti-Lever Couplings



BROWN ENGINEERING CO. 126 N. THIRD ST. **READING, PA.**



Boyar-Schultz SMB Bolts

Good machine bolts cost much less than repairs to costly machines caused by worn out, misshapen bolts of soft steels.

SMB Bolts are made from special heat treated steel and are machined with head square with the body. This permits firm adjustment that holds work securely through heavy machine cuts. SMB Bolts save the machine, save the job and save time.

Best results are obtained when SMB Nuts and Washers are used with SMB Bolts. They are heat treated, and nut threads are cut square with face.

BOYAR-SCHULTZ CORPORATION
2108-D WALNUT ST. CHICAGO, ILLINOIS

Pratt Grinding Gauges caliper external cylindrical jobs while work is in motion or at rest. Adapted to straight or tapered work. Tolerances of .0001″ plus or minus easily maintained. Visible check on out of roundness, rough grinding and chatter. Cannot grind work undersize unknowingly. Easily installed on any grinder. Pratt Grinding Gauges increase production, eliminate scrap and assure accuracy. A modern precision tool, ruggedly built.

Send for Bulletin

American
DIAMOND TOOL & GAUGE CO.
15920 WOODINGHAM • DETROIT, MICH.

SPACERS

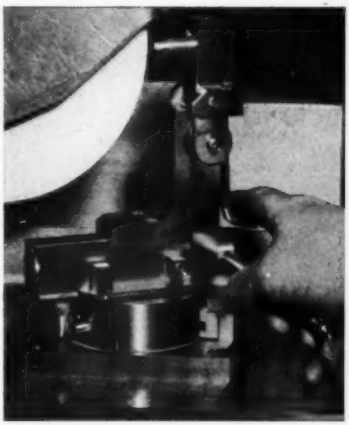
Where accurate spacing of cutters on milling machine arbors is required, use of ready-made, modern spacers saves so much time that no attempt should be made to grind special spacers for the purpose. Arbor spacers may be obtained to fit any size of arbor. One type of spacer readily obtained is made of metal. It is unaffected by either oil or heat, may be used over and over again, and can be had in stock thicknesses of from .001″ to .125″. In addition, the same firm provides specials of required lengths, cuts them from bar stock ground to decimal sizes.

A different type of arbor spacer, convenient for quick setup, in that no time need be spent looking for the thickness stamp on the washer, or in applying a micrometer to find it, is made of plastic of various colors. Colors reveal the different thicknesses, directly. In thicknesses of from .001 to .030″, and in reasonable increments, they combine conveniently for given settings. Either types mentioned may be used with longer known-length spacers on straddle - milling jobs or where spacing is of great importance.

Accurate spacing of milling cutters does not altogether depend in these days on the types of spacers mentioned, however. There are micrometer - adjustable spacing collars with which slight changes in spacing can be made without taking cutters from the arbor. With such a collar included in the spacers on the arbor between cutters, all that is necessary is to loosen the arbor nut, and the collar can be adjusted readily by an amount as fine as a quarter-thousandth in either direction. This is done simply by rotating one of the collar elements with a pin, and it is directionally marked so that one knows whether he is adjusting in a plus or minus direction.

In addition to the spacing collar mentioned, another and a longer unit has been noted. This has an adjustment range of nearly one-half inch. It is a real aid for a fast and accurately-spaced setup.

A RADII & ANGLE DRESSER
OF PRECISION AND VERSATILITY



An instrument of precision and versatility . . . Operation is simple requiring no high degree of skill for accuracy . . . Any one of the following can be produced with one setting:

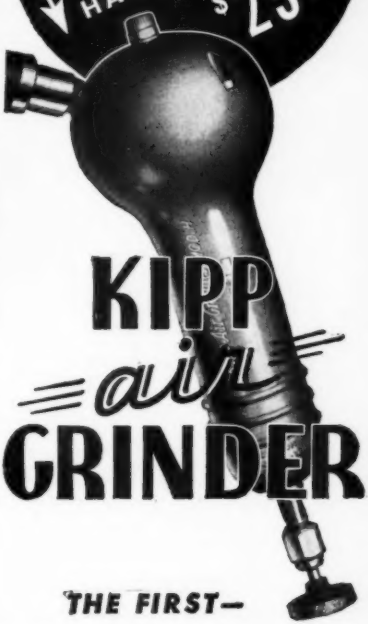
One angle
Two angles
Concave radii up to 6'
Convex radii up to 4½'
Two Angles and radius.
Many other diversified forms to meet requirements.

Wheel size capacity—9' dia; angular travel 3"; for use on universal surface and cylindrical grinders.

Full details available on request.

MANUFACTURED BY
J & S. TOOL CO. 477 Main St., East Orange, N. J.
PRECISION DRESSING TOOLS

50,000 R.P.M.
MORE POWER
HANDIER GRIP
$29.75



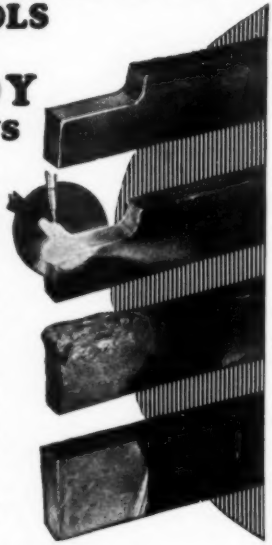
KIPP
air
GRINDER

THE FIRST—

and always the old reliable High Speed Air Grinder for Tool Rooms and Production Work!

MADISON-KIPP CORPORATION
207 Waubesa Street, Madison, Wisconsin, U. S. A.

MAKE YOUR OWN
CUTTING TOOLS
with the new
COLMONOY
W C R ALLOYS



Bridge the gap between high speed steel and the carbides. Reclaim old, and make new cutting tools by welding. The process is simple.

To fabricate a typical tool—

1. **Undercut carbon steel shank, leaving a fillet for ease in welding.**
2. **Fill undercut, using ordinary hard facing welding procedure.**
3. **Hot wipe, to approximate shape, to save grinding.**
4. **Wet grind, using green silicon carbide rough and finish wheels.**

WRITE FOR LITERATURE

Immediate delivery of all grades of W C R Alloys at all branches.

WALL-COLMONOY CORP.

720 Fisher Bldg., Detroit, Mich.

Branches in New York City, Blasdell, N. Y., Chicago, Tulsa, Los Angeles, and in Canada

ABRASIVE STONES

Oilstone files, impregnated with oil at the factory, may be depended upon to cut cool. They are much favored for various types of hand-stoning operations. Stones of this type may be had for practically any speed of cut, coarse, medium, fine and superfine, the finest being of hard Arkansas stone. Tool and die makers depend upon such stones very heavily, and it is in the tool room that they have their chief use, though they can be used for many exacting operations, close fitting of delicate parts, and similar work.

It is well known that abrasive sticks or hones bear close mechanical relationship to products in which accurately - finished inside cylindrical surfaces are involved, as in bearing-races, engine cylinders, pump cylinders and gun barrels. Honing gun barrels in large guns is a highly important operation. Recently noted, was a report from a hone producer, with reference to large coast defense guns. There cannot be the slightest imperfection in the bore of these huge gun barrels, and they are finished by honing to microscopic accuracy. Barrels are honed with giant machines equipped with the proper hones.

One mark of the efficiency of honing sticks is low heat generation. Hones inevitably generate some heat, but the lower that such heat can be held, the more efficient the operation. The bonding agent holding the abrasive together has much to do with heat generation. One hone manufacturer uses a special bond he has developed, allowing a measure of control of uniformity not before attained. Heat generation is held to a low point.

When you come to stoning carbide tools, either for resharpening or forming small radii, you are going to need a stoning tool that is hard.

Such are made by applying diamond grits in different sizes to a suitable backing, grits being held in a tungsten carbide binder. These hones are fast cutting and have a long life span.

DI-ACRO Shear squares and sizes materials, cuts strips, makes slits or notches, trims duplicated stampings. Shearing width — Shear No. 1 — 6". Shear No. 2 — 9". Shear No. 3 — 12".

She's Fighting TOO!

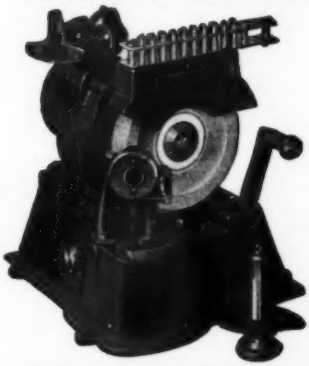
Making Parts Without Dies

No delay waiting for dies — parts ready quicker — deliveries speeded up — all to bring the Victory sooner! Women are rapidly taking a major place on the industrial front. DI-ACRO Precision Shears, Brakes, Benders, are ideally suited for use by women in making duplicated parts accurate to .001"—DIE-LESS DUPLICATING. Thousands of DI-ACRO Machines are now in use in War plants. Get the whole story—write for catalog—"Metal Duplicating Without Dies."

O'NEIL-IRWIN DI-ACRO PRECISION MACHINES MFG. CO. 314 8th Avenue So., Minneapolis, Minn.

• SMALL GAUGE DRILLS ARE ALSO CRITICAL TOOLS •

ACCURATE GRINDING PREVENTS WASTE—PROLONGS USEFUL LIFE



BLACK DIAMOND

PRECISION DRILL GRINDERS

Motor driven, these highly efficient Black Diamond Grinders are doing yeoman service in hundreds of large and small war production plants throughout the nation.

They not only produce quantities of perfectly sharpened small gauge and fractional drills, with lips of uniform length, correct angle and proper clearance for true, accurate drilling—but release skilled mechanics for more important work.

The Web thinner, an important attachment, cares for the proper grinding of Notched, Colton or so-called Crankshaft points . . . and the diamond dresser keeps the grinding wheel always sharp.

Write for Bulletin 122

BLACK DIAMOND SAW & MACHINE WORKS, INC. NATICK, MASS.

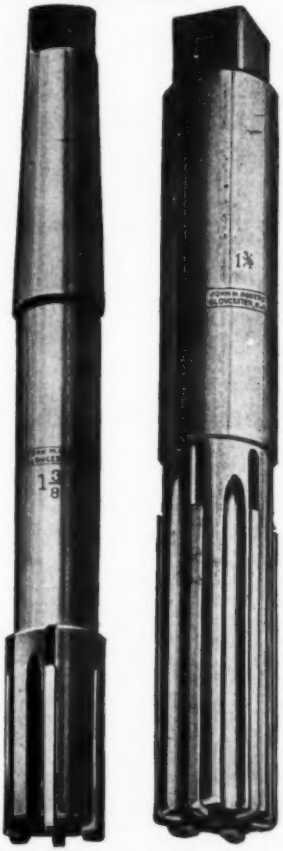
FOR HOLDING END MILLS AND OTHER TOOLS YOU CAN RELY ON
UNIVERSAL COLLET CHUCKS

For gripping a tool "as strong as solid steel itself," you simply cannot beat a Universal collet chuck. The Universal chuck in the operating picture shown is holding a Putnam end mill while roughing cuts in high chrome steel. Universal chucks have ground threads, ample room for tool feed out and nut for Spanner wrench. Write for facts.

PHOTO COURTESY PUTNAM TOOL COMPANY

UNIVERSAL
ENGINEERING COMPANY
FRANKENMUTH, MICH.

ROGERS REAMERS
SINCE 1885



Conserve High Speed Steel by using Rogers inserted Blade adjustable-for-wear Reamers

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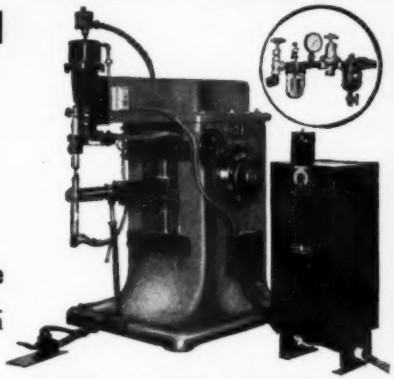
GLOUCESTER CITY NEW JERSEY

DESIGNED FOR ALUMINUM AND STAINLESS STEEL

This NEW

DYER

Spot Welder KT Model Press Type



Made in Voltages to meet Special Requirements where high Amperages and Controlled Pressure are required.

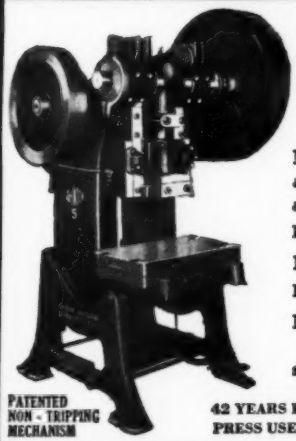
Timing Equipment for Special Jobs.

Air Operated, Oil Lubricated with Air Gauges for controlling pressure.

Water Cooled Electrodes — Refrigerating System may be added for High Production.

For additional information outlining exactly how this new welder will increase your production. Send us complete details regarding your welding problem. These Welders are individually designed to fit your needs.

300-322 Jackson St. THE TOPEKA FOUNDRY & IRON WORKS CO., Topeka, Kansas



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UNLIMITED PEAK PRODUCTION

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Much larger die space than average presses. Engineered and designed for unlimited peak production.

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Solve Difficult Angle Jobs

- ★ For Tool Room — Production Line — Bench.
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Mfrs. of PALMGREN PRODUCTS for over 25 years
8384 South Chicago Avenue, Chicago, Ill.

PRECISION WORK AT ANY ANGLE

BLACKOUTS

We have learned much about blackout technique during the past year, said S. A. Hibben, director of applied lighting, Westinghouse Lamp Div., Bloomfield, N. J., at a meeting of American Physical Society, Pittsburgh, recently. We know now, for instance, that when the air raid sirens sound, it is neither necessary nor desirable to sit in the dark in an atmosphere of nervous tension. The idea is to blackout the enemy, not ourselves. We have learned that it is quite possible to have a complete exterior blackout without sacrificing adequate interior illuminating efficiency.

In case of air raids or blackouts, he said, the people should be prepared to carry on vital work without interruption. The average citizen should know how to maintain healthful conditions in his home and how to avoid accidents during the blackout period.

Present day industrial architecture represents the ideal in industrial protection. It provides such important features as windowless construction, shatterproof glass, minimum of skylights, neutral exterior coloring and light interior painting.

One of the most interesting developments in blackout technique had been that of phosphorescent and fluorescent materials, Hibben pointed out. Phosphorescent coatings will glow in the dark without light being shined upon them, while fluorescent materials glow when irradiated by ultraviolet light which itself is invisible.

Recommending the use of luminous markers and signs to denote exits, doors and factory aisles, Hibben also described its use on clothing and automobile exteriors. In addition, he added, phosphorescent coatings may be used to outline door knobs, switches, stairs, railings, paths to air raid shelters and in many other locations.

GIVE TO THE RED CROSS!

MODEL No. 16 "SPECIAL"

CONSTRUCTED AS PER SPECIFICATIONS OF U. S. NAVAL AIRCRAFT FACTORIES

BUTTERFLY FILING and SAWING MACHINE

(Die Making Machine)

This is a very heavy, powerful machine and is designed for extra heavy filing and sawing, but it performs small work just as well. This type of machine is usually adopted in Ammunition Plants, Airplane Factories and machine shops where heavy and precision filing and sawing is desired. We also manufacture smaller models—Model D-10" Table; Model E.L. 12" Table.

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Our machine carries the Butterfly trade mark.

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Registered U. S. Patent Office

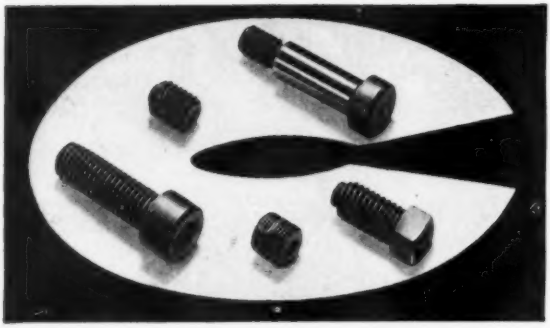
Precision PAL TOOLS Gauges

Mechanics will welcome the introduction of the PAL Precision Gauge, with improved feature of close adjustment. The PAL Precision Gauge is a dependable and handy measuring tool and is offered at a very reasonable price. • The PAL Precision Gauge is 10¼ inches in height, has a full 6¾ inch range. It can be converted from a calibre to a height gauge in ten seconds, and has direct reading inside and outside.

The PAL Precision Gauge has many new features, including the following: — Plastic base, making it lighter and rust proof; cast iron sole plate for longer wear; detachable scriber; swift motion assembler which eliminates all thumb screws; self-locking sensitive adjustment.

PAL TOOL COMPANY

2300 EAST THIRTY-FIRST STREET MINNEAPOLIS, MINNESOTA



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Serving With Our Armed Forces!

They served in 1898 . . . They served in 1917 . . . and they were among the first to be enlisted in the present global war.

Today, The Chicago Screw Company products are performing an essential service in the war production program. These superior quality, precision-made screw products are being utilized in the construction and maintenance of fighting ships, planes, tanks, trucks and machinery for allied war needs.

We will be Victorious!—and our vast production facilities and our sales organization will again be devoted to serving the needs of a peaceful world.

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Order from your distributor!

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THE CHICAGO SCREW CO.

ESTABLISHED 1872

1026 So. Homan Avenue — Chicago, Ill.

GRINDING DISCS

Whether your disc grinding machine be portable, used chiefly for smoothing, or whether it be of production type, for sizing and heavier operations, the discs you use have much to do with the work accomplished. It is evident that a machine can be no more efficient than the disc with which it is fitted.

In inferior grinding discs of the past when a high degree of frictional heat was generated, they would soften, fill up, glaze and burn, quickly becoming worthless. One manufacturer makes discs by bonding abrasive into a special compound which will not soften even at 1500° or more. They have very high grinding efficiency and long life.

With portable disc grinding machines, the problem has been not only to have a good abrasive and a bonding agent to resist frictional heat without softening. It was also to have a suitable backing for the abrasive, to be both staunch and flexible. These qualities are combined in one disc which has a backing of phenolic fibre. This has proved to be a tough mounting which stands up under gruelling service.

Grinding discs, for heavy surfacing work, have center portions removed in most cases. There would be no good point served in allowing center portion to remain. The closer to the center one approaches, the slower is the travel of the abrasive surface at any given rpm. Really, the cutting principle of the disc is not ideal for this reason. Yet it offers so good a method of generating a flat surface that it cannot be sacrificed. One firm, making a large line of abrasive discs which give remarkable surfacing results on terra cotta, asbestos compositions, hard rubber, etc., as well as on all kinds of tough metals, reinforces them with wire, to strengthen and hold them against centrifugal strains at high speed. Another, making an equally well-known line of discs, imparts outstanding strength by fitting them with steel backing. It furnishes discs for all popular disc grinding machines.

(Manufacturers identified on request.—Ed.)

NEW Rouse HAND MILLER FOR SMALL PARTS

$98.00
(Without Fixtures)
F. O. B. Chicago
Motor Extra

The NEW Rouse Hand Miller will help you speed up your small parts production, and enable you to get maximum output with inexperienced help.

The Rouse Hand Miller is a high-speed, ball bearing, motor driven machine for making light cuts in brass, aluminum and steel. It will handle efficiently small rounding and burring operations on steel and cast iron parts.

Priced low, the machine can be kept set-up for special operations with minimum machine-hour cost.

The Rouse Hand Miller is an accurate, sturdy machine, the development of many years of experience in producing fine small tools and parts. It has proved itself in the production of airplane parts, radio equipment, motor parts, instruments, light ordnance, and similar work. Prompt delivery can be made. Write, telephone, or

H. B. ROUSE & COMPANY
2214 North Wayne Avenue, Chicago

IMMEDIATE DELIVERY

ON THE NEW ATLAS DIE-FILING MACHINES

Can be used for all kinds of die making. The overarm is constructed so that the file and saw attachments may be interchanged with little effort. The holddown fingers are attached directly to the overarm. Working surface of the table, which tilts two directions, is entirely clear. An improved type chuck, consisting of movable hardened jaws, holds both saws and files. Screw adjustment makes changes easy and fast.

Price, complete with motor— **$125.00** Net
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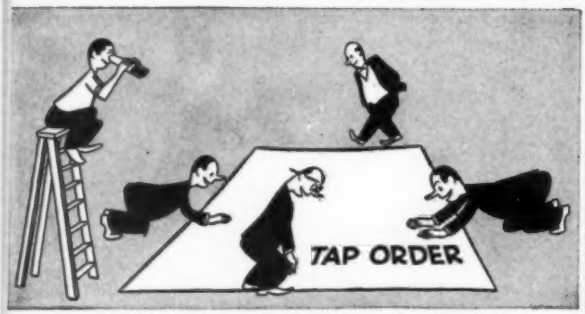
ATLAS EQUIPMENT CO.
103 S. Clinton St., Chicago, Ill.



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Your order for taps gets PERSONAL ATTENTION from Threadwell and its distributors. If it can't be filled at once, every effort is made to expedite it. They try and try to get you the taps you want WHEN you want them. And often they produce the goods, as excerpts from customers' letters give proof.

THREADWELL TAP AND DIE CO., Greenfield, Mass., U.S.A.

★

EXPORT STOCKING DISTRIBUTORS
CANADA: Bridge Machinery Co., Montreal
ENGLAND: Skyfux Ltd., London

Threadwell
"TAPS OF DISTINCTION"

ADAPTERS

Maintenance of a suitable supply of cutter adapters at the milling machine is a matter that should have close attention. Generally, it pays to buy them rather than make them, especially where milling machine is one with a standardized spindle end.

There may be a case calling for making an adapter. One happened in a plant with a lot of splining and similar work to do with small taper-shank end-mills, held in taper-sockets of large spindles. To avoid using collet and collet holder, a solid adapter was made so small taper-shank end-mills could be directly applied, and removed with a drift-pin.

One firm which makes a splendid line of straight-shank end-mills, also developed an especially good combination adapter for mounting and driving their mills. Outer sleeve, or adapter, is a quick-change unit. It is fitted with 2 lugs on its face end. Into this adapter, which is taper-bored, slips an end-mill holder.

It has a tapered body to suit the taper-bore in the adapter, and a flange of annular type, into which are milled 2 recesses to fit over the lugs on the forward face of the adapter, giving positive drive. Two hollow-head screws are provided in the end-mill holder to tighten down on the shank of the end-mill used. One of the screws extends down thru the flange mentioned. It provides a screw with a highly generous length of thread.

Even though you have a threaded-nose spindle, and want to use face milling cutters with tapered holes, you can do it with adapters provided by one builder of milling equipment. This adapter is a 2-piece unit, inner part being a tapered sleeve. Taper on sleeve accommodates the cutters. Interior of sleeve is threaded to screw onto spindle nose. A driver is used with the draw-in bolt, to seat cutter tightly on sleeve, making a perfectly true and rigid setup.

PATENT APPLIED FOR

ABER

SPECIAL

Curved Tooth

MILLING CUTTERS

with

"CHATTERLESS FLOWING ACTION"

- Higher Speed (R.P.M.)
- Longer Cutting Surface
- Longer Life

There is no lapse of cutting contact. Each tooth begins to cut just as its predecessor is finishing its cut. The continuous shearing is known as "Chatterless Flowing Action." Smooth, accurate finishes are maintained. Increased speed (RPM) means increased production. Save time and money with ABER curved tooth milling cutters.

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Built in sizes ½ to 75 hp brake test, in Standard Open Types . . . Drip or Splash Proof . . . Totally enclosed . . . Explosion Proof . . . Flanged Types . . . Gearhead . . . Special types built to specifications.

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LIMA ELECTRIC MOTORS - MAGNETIC POLISHING LATHES - GEARSHIFT DRIVES - PEDESTAL GRINDERS

THE PERFECT POLISHING LATHE
THIS polishing lathe with hollow spindle adapts itself to high volume production of long pieces, or short. For lapping, burring or polishing. Greatly simplified; operated by hardened and ground face cam mechanism. Full ball bearing. Available in 14 models for collets or chucks. Write for details.
Crozier
Crozier Machine Tool Co. • Hawthorne, California
Successors to C. W. C. Corporation

GUN MACHINING

Regardless of the great breadth of this subject, and the fact that hardly any man will ever have it fully in hand, isolated glimpses into the field prove interesting. Some of the shapes and forms that must be accurately machined present real problems, if the work is to be done in reasonable time. Teeth which must be machined in gunner's quadrants, internally and at a given curve, present a case in point.

Some used a special broach, fitted with a special clamping and holding fixture, which would cut all teeth in the quadrant at one pass. It put a precision job on a production basis.

After drilling and rough-reaming, barrels are machine re-centered before turning. Obviously, the larger the bore in the barrel, the larger will be the required re-centering cut to give proper bearing for turning. Different models of machines are available for barrels of .3 and .5 bores, and also for re-centering barrels of various lengths from 16" to 46" long. These machines have been so designed that new center holes drilled will be concentric with barrel bores, regardless of eccentricity which may exist between bore and exterior. This insures barrel being turned concentric with bore. Drilling and reaming machines for gun barrels are naturally very high in the scale of importance.

Machines have been designed which incorporate modern refinements. One drilling from the solid, can be arranged later to ream or bore by either push or draw principle. Wide range of feeds and speeds makes it adaptable for either type of operation.

Rifling machines, too, are appearing in new and improved models.

Nothing is spared to make gun barrels everything they should be. One machine, hydraulically and electrically operated, has 2 operating stations, each fully independent of the other.

* * * * *

"THROW YOUR SCRAP INTO THE FIGHT!"

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Gusher
COOLANT PUMPS

Write for descriptive literature

Made in various types and sizes from 1/30 to 2 H.P. Pumping capacity up to 200 g. p. m. Many patented and exclusive features.

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Manufacturers' Representative with 20 years' experience throughout Indiana desires accounts to handle on commission basis or otherwise calling on manufacturers and tool and die shops.

TOOL AND DIE MAKERS SUPPLY CO.
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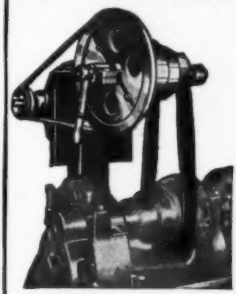
STEEGE MOTOR DRIVES FOR DEFENSE GUARANTEED FOR FIVE YEARS

No chance of breakdown, doing a good job powering machines for defense production. No noise, floating cone, results 100% power. 8 years of production proof of durability. Easily installed.



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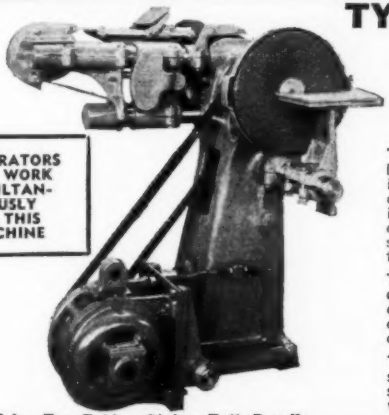
W. L. STEEGE MACHINERY CO.
100 So. Jefferson St., Chicago, Ill.

TYPE "R" MULT-I PURPOSE

Disc grinding, polishing and surfacing machine



3 OPERATORS MAY WORK SIMULTANEOUSLY ON THIS MACHINE

This Type "R" Machine is a combination of several types of grinding and polishing machines, principally the Disc Grinder, the Polishing Wheel and Belt Surfacing Machine. The machine is set up and supplied to do the work of these three machines.

This utility machine is adapted for a wide range of uses and will find a place in many shops where space and power are important factors of consideration.

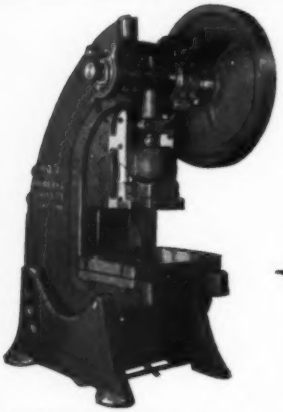
The arrangement of the machine is such that three operators may work simultaneously without interfering with one another.

Write For Folder Giving Full Details.

PRODUCTION MACHINE CO.
GREENFIELD, MASS.

CUSHION MANPOWER SHORTAGE WITH THIS

PRESS OF MANY USES



Federal Presses today are serving in a wide variety of unusual ways—cushioning manpower shortages—speeding production of war equipment which formerly required special machinery—reducing costs! Primary, secondary, and assembly operations are accomplished quickly, safely, precisely. Burnishing, forming, staking, and high speed marking are handled with ease. Write for help with your special press work problems. No obligation!

THE FEDERAL PRESS CO.

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Assembly time substantially reduced by staking terminals of radio switch section on a 12-station Federal Dial Feed Press.

Machine gun belt links, made complete from strip stock, are produced accurately at high speed on standard Federal Presses.

Special part pressed in place and stud riveted in rapid assembly operation on Federal Dial Feed Press.

Federal Presses are used for several precise forming operations in the high speed manufacture of bullets.

FEDERAL

OPEN-BACK—INCLINABLE

PRESSES

POSITIONING

There are many ways worked out by welders in different shops to hold work in position convenient for welding. That usually means holding work or an assembly so welding can be done in a "down" direction. Vertical and overhead welds are more difficult, consume more time, and do not result as well as when the welding can be done hands down. In torch welding large castings, pre-heated and kept hot while welding (except where modern low-temperature welding alloys are used) a sand table, made up with fire brick, with a furnace underneath, is sometimes used. Thus, heavy casting can be turned practically any position in the hot sand. Excavating a bit gives proper support, and it stays where put.

So far as positioning of pipe, shafting or other lineal material is concerned, when end-to-end welding is involved, it can be arranged in V-blocks. Two pairs are arranged to hold 2 pieces, either with a true butt weld, or at any predetermined angle with one another. Or, having arranged a jig-type fixture to hold any part to which a piece of pipe or other lineal material is to be welded in any specific position, one pair of V-blocks can be arranged in proper relationship to give the right result.

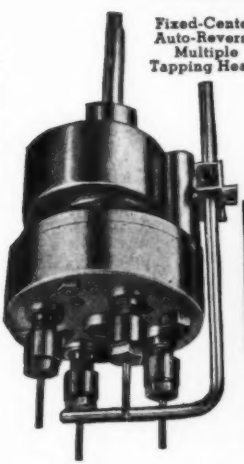
To the ingenuity of welders as applied to this problem, has been added splendid commercial equipment which speeds weldments too difficult to manipulate by such ordinary means. One welding positioner has a hydraulic tilting and hydraulic elevating table which revolves mechanically, power for revolving being supplied through a worm gear. This unit has a capacity of 2,000 pounds. The table can be revolved by means of a hand crank, and it is 30 inches in diameter. However, this is one of the smaller units which have been designed and applied to handling weldments.

Positioners are available from different firms in great array. Some of them controllable in all motions by pushbuttons, and highly flexible as to application.

ERRINGTON MECHANICAL LABORATORY

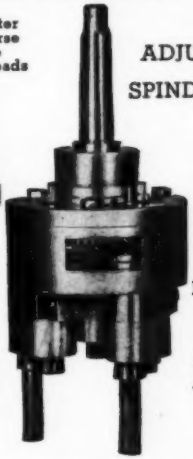
STAPLETON, STATEN ISLAND, N. Y.

MULTIPLE HEADS



Fixed-Center Auto-Reverse Multiple Tapping Heads

ADJUSTABLE MULTIPLE SPINDLE DRILLING HEAD



All Parts Fully Enclosed to Insure Pressure Lubrication and Rigid Support of Adjustable Spindles

Super-Sensitive Fixed-Center Multiple Drilling Heads

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FOR USE IN AIRCRAFT AND DEFENSE INDUSTRIES

Every defense plant needs SOUTHWEST Plastic-Tipped Mallets. They can be used for sheet metal work, radio, electrical work, caulking, lamination, upholstery, and assembly work of all kinds. They can also be used on metal and plated surfaces without any damage to the material. Extra tips are immediately replaceable by hand because they are threaded.

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DURO, aircraft type, punch presses are constructed to precision punch aluminum, dural, and other sheet metal and plastics. Write today for illustrated catalog on Duro Punch Presses, Bench Milling Machines, and Accessories.

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$85.00
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The design, operation and characteristics of the various types of industrial distribution systems are described in a new 24-page Westinghouse booklet.

Plant distribution systems are described, advantages of each are stated, cost, flexibility, reliability, regulation and efficiency are discussed. A full page schematic diagram of each system is included.

On page 2 is a diagram of the conventional radial distribution system, and on page 3 is a discussion of the system characteristics. On page 4 is the simple radial system, and on page 5 is a discussion of its characteristics. Presented in the same manner are the loop primary radial, the banked secondary radial, the primary selective radial, the secondary selective radial, the simple network, the primary selective network, and the spot network systems.

A copy of booklet B-3152 may be obtained from department 7-N-29, Westinghouse Electric & Mfg., East Pittsburgh, Pa.

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MILLED FROM BAR

SOCKET HEAD
CAP SCREWS

SAFETY HOLLOW
SET SCREWS

Try Them On Your Next Job!

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Today, you'll enjoy your stay at Hotel Lafayette more than ever! Extensively remodeled, and redecorated, this fine hotel offers new convenience and comfort —but the friendly hospitality is the same as ever. Excellent food, home-like rooms, reasonable prices. And remember: Hotel Lafayette is Buffalo's most centrally located hotel. Moderate rates: Single, $2.75 up; Double, $4.50 up; special rates for 4 or more.

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STEELGRIP BELT LACING

A strong lacing for all types of belts. Put on with a hammer in a few minutes. Clinches smoothly into belt, compresses ends, prevents fraying. 2-piece hinged rocker pins provided. 8 sizes. In boxes, handy packages, cartons and long lengths.

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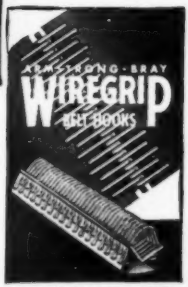
Both types from 1 source

BELT HOOKS come with blue aligning cards that prevent waste—every hook can be used. Protects fingers. Applied with a WIREGRIP or any other standard Belt Lacing Machine. 6 sizes.



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PRECISION BENCH MILLER

Tapered Roller Bearings

for high-speed production or precision tool room work. Tool direction adjustable to 60 degrees each side of center.

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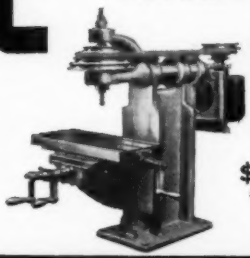

$281.65
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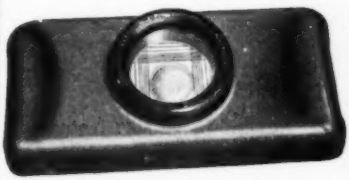
FELL *PRECISION LEVEL*



A precision "all-way" level for use in machine tool building, setting up and maintenance, whether for establishment of level working surfaces or for the accurate checking of straightness where true level itself is not required.

Graduations are in .0005" per foot and form squares about a circular bubble, thus giving coordinate readings and showing the direction and amount of slope, if any. Made in two sizes—5½"x12"; 3½"x6".

Write TODAY for bulletin giving full details.

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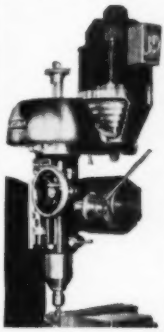
for

Heavy Duty Operations



Uses many types of cutters on a wide range of work. 1/16" to ¾" end mills.

FEATURES

Large size spindle with No. 9 B&S Taper. Large Quill Diameter with a travel of 4". Furnished with ½ h.p. motor.

The aluminum pulleys provide a range of six speeds, from 250 to 3000 R.P.M. The spindle takes 1/16" to ¾" end mills. Quill is counterbalanced and hardened and ground. Overarm brackets equipped with spreader screw for easy mounting.

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MACHINING COPPER ALLOYS

To assist the many plants machining copper, brass, bronze and nickel silver, a new 32-page booklet, "Machining Copper and Copper Base Alloys", Publication B-3, First Edition has been issued.

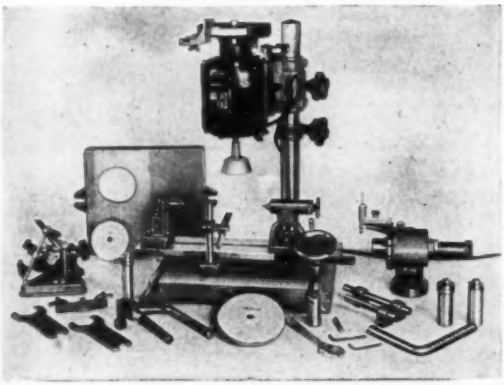
Cutting speeds, feeds, tool rakes and clearances are suggested for basic machining operations including turning, parting, forming, drilling, reaming, tapping, threading, and milling. Cutting tool materials discussed include carbon steel, high speed steel and tungsten carbide tipped cutters.

Machinability ratings, tables of compositions, physical constants and physical properties on more than 40 copper base alloys are included, from free-cutting brass to copper, the tough bronzes and copper nickel alloys. The booklet also includes convenient weight tables, conversion factors, and references to Standard Specifications.

Copies are available without cost from The American Brass Co., Waterbury, Conn.

HERE IS THE NEWEST DEVELOPMENT IN CUTTER AND TOOL GRINDING EQUIPMENT

A NEW LAFAYETTE TOOL



SAVE TIME, SPACE AND MONEY IN YOUR TOOL ROOM WITH THIS *NEW* CUTTER AND TOOL GRINDER

Precision, accuracy and finish in the grinding of milling cutters of all types — end mills — tapered, straight, spiral reamers—side and face milling cutters—spot facers —counterbores— hollow mills — shell end mills and reamers—staggered tooth mills—gear and form cutters—circular saws — as well as surface and contour grinding—is economically provided by this new Cutter and Tool Grinder.

Simplicity of operation permits fast setups and does accurate, precision grinding in less time than is normally required. Accurate grinding increases production and lengthens cutter life. Compact design of the machine conserves floor space and makes it easily portable.

The precision Center Fixture, may be used separately as a general purpose Bench Center for accurate, economical inspection of circular and cylindrical parts, and any other uses. Parts being inspected are held and rotated on an arbor or on their own centers and moved in a horizontal plane under a dial indicator. Fixture has adjustable tail stock that permits adjusting the centers into precision alignment.

Furnished Complete with all Accessories and Center Fixture.

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Especially adapted for holding work with short bores while being machined between centers on lathes, grinders, millers, shapers, etc.

Size No.	Range of Bores Taken	Net Price
1A	½" to 1"	$12.00
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3A	1½" to 2"	23.00
4A	2" to 3"	34.00
5A	3" to 4"	40.00

TYPE B—STRAIGHT JAW DESIGN

Adapted for work with both short and long bores.

Size No.	Range of Bores Taken	Net Price
1X	½" to 9/16"	$10.00
2X	9/16" to 21/32"	11.00
3X	21/32" to ¾"	12.00
00	¾" to ⅞"	14.00
0	⅞" to 1"	16.00
1	1" to 1¼"	18.00
2	1¼" to 1-9/16"	21.00
3	1-9/16" to 2"	29.00
4	2" to 2½"	40.00

(Other Sizes Taking Up to 7" Bores) Hardened tool steel, accurately ground. Sold singly or in sets. Prompt delivery. Write for bulletin.

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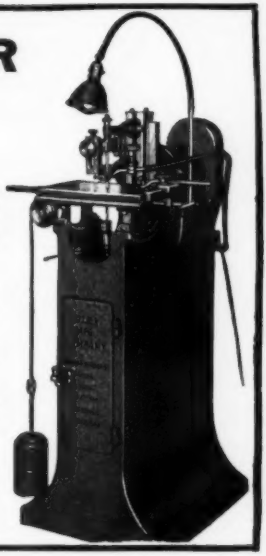
Completely finish files all Through Type Dies



Handles most intricate dies with small holes and sharp corners, as only smallest lead hole through which saw or file can pass is necessary. Compound angle filing is fast, accurate and easy with the Foley Die-Making Machine. Adjustable table tilts 20° front, 10° back. Ram tilts 20° right or left. Has 6⅜" throat—saws to center of 12¾" piece.

USES ANY STANDARD OR SPECIAL FILES—From the smallest needle file to the coarsest bastard file can be used in this machine without any special holding fixtures.

TAKES ANY SAW—Any type of saw from the finest saw to the high power high speed saw can be used without delay of changing holding fixtures. No holes in blade necessary.

PAYS FOR ITSELF—The Foley Die-Making Machine usually pays for itself in 400 working hours. Write today for literature and full details.

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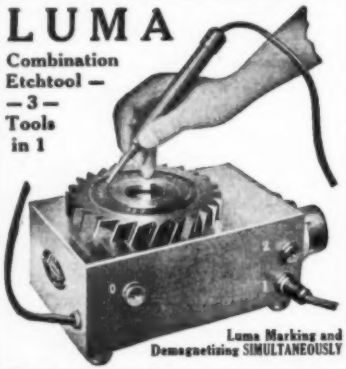
A new safe, quick change cable connector is said to meet every requirement of the welding industry. For example, the screw and tapered sleeve construction is claimed to make locking positive and a simple ¾-turn in the opposite direction connects or disconnects the cable in less than 3 seconds. No tools are required. There are no bolts, nuts, washers, or gadgets to loosen and no tape to wrap or remove. This construction is claimed to assure high conductivity and to eliminate possibility of shorting, fire hazards and damage to work or equipment.

The makers emphasize that with shortage of materials, and with production being forced to the maximum, Rapid Cable Connectors make it possible to reach all parts of a job with short cables.

Rapid Cable Connectors will handle 1, 1/0, 2/0, 3/0 and 4/0 Cable and are recommended for various types of conductor cables such as on supply lines, ships, electric railways, mining operations, etc. Bulletin 0-4 gives complete details, prices, etc. and is available from Chicago Tool & Engineering Co., 8384 South Chicago Ave.

LUMA

Combination Etchtool — —3— Tools in 1



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Writes on hardened steel — demagnetizes at the same time—with carbon point does light spot annealing and soldering jobs. Compact—easy to use—dependable.

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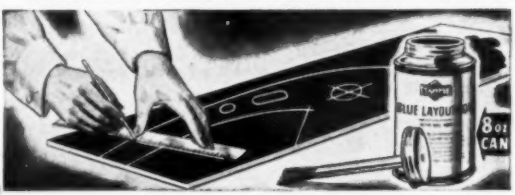
Speeds layout time on brass, aluminum, copper, tin, stainless steel. Won't chip, crack, or flake off. Comes in handy 8 oz. bench type brush-in cans. Also pts., qts., gals., drums. *Send for sample now!*



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U. S. Full Anti-Friction Bearing Hand Feed Milling Machine

A simple, powerful hand feed machine, with six spindle speeds ranging from 160 to 1460 R. P. M., making it suitable for all classes of light milling; the high speeds making it possible to use small end mills and keyseat cutters to full advantage, without use of supplementary high speed attachments.

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External Grinder

Grinds work 7" wide, 11" long.

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Many plants, even those fluorescent lighted, have achieved still greater production by equipping machine tools with on-the-spot, even-glowing VIMCOLIGHTS. They help to lessen costly errors and rejects . . . because eye strain is reduced. Send for circular.

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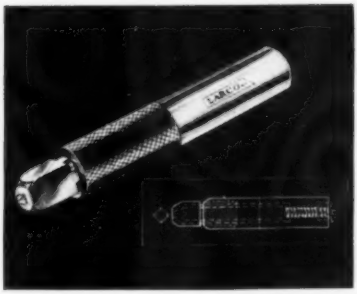
WESTINGHOUSE MACHINE TOOL FORUM

The application of electronics to metal working tools will be explained by electronic engineers as one of the features of the 1943 Westinghouse Machine Tool Forum, to be held at the Company's East Pittsburgh, Pa., works, April 6-7. Many of the problems facing machine tools manufacturers and users, today and in the future, will be discussed by recognized experts during the two day sessions.

This will be the eighth annual Forum sponsored by Westinghouse. The Forum is planned to provide an opportunity for machine tool engineers, representatives of machine tool user companies and executives of machine tool manufacturers to discuss electrical problems relating to the design and function of machine tools.

In addition to the forum on electronics applications, which will be featured by demonstrations by Westinghouse research engineers, there will be at least six other major papers on current problems presented before the Forum. Also scheduled for appearance are government representatives, leaders in the machine tool industry and Tell Berna, General Manager of the National Machine Tool Builders Association.

"PLUS FIVE" DIAMOND TOOL.— Said to enable operator to reset the point of the diamond himself—efficiently and speedily (in fractions of a minute). No need to send it back for resetting, or to carry a reserve tool stock. According to the



makers, it is made so that on any of the 6 interchanges of point, the octahedron diamond is always in dead-center. Holder may be retained indefinitely for continuous use on dressing jobs. A product of the Larco Tool Division of Louis A. Roselaar, 551 Fifth Ave., New York.

REYNOLDS COOLANT SYSTEMS FOR MACHINE TOOLS

No. 2-S

Approximate capacity, 12 gal. No tank. ½ H.P. motor. For Milling and Screw Machines, Lathes, etc. 110 volt, 1 phase model, and 220 volt, 3 phase model—$75.00 each. 550 volt, 3 phase model, $86.25.

No. 1-S

Approximately 7 gal. capacity; 16" x 10" x 11" tank. ¼ H.P. motor. For Milling and Screw Machines, Lathes, etc. $98.50 each for 110 volt, 1 phase model, and 220 volt, 3 phase model. 550 volt, 3 phase model—$108.50.

No. 206

Approximately 15 gal. capacity. Tank 20"x16"x16". ¼ H. P. motor. For grinding machines, multiple spindle drills. $95.00 each for the 110 volt, 1 phase model, and 220 volt, 3 phase model. $112.00 for the 550 volt, 3 phase model.

Dealers Write for Resale Discounts

REYNOLDS MACHINERY CO.
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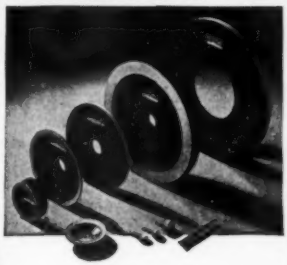
DIAMOND WHEELS
RESINOID BONDED

SECOMET



SECOMET Resinoid Bonded Diamond Wheels can do your work more accurately, faster, and without appreciable wear. They are most economical for sharpening cemented carbide and multi-bladed tools, such as milling cutters, broaches, etc. Moreover, their sharp, free-cutting action eliminates lapping and the usual semi-finish grinding operation. Catalog on request.

Prompt deliveries

J.K. SMIT & SONS, Inc.
157 Chambers St.
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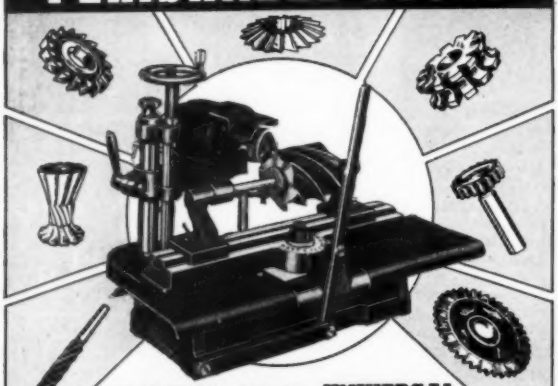
Get Longer Life From Your
PERISHABLE TOOLS



HILCO UNIVERSAL TOOL and CUTTER-GRINDER

Perishable tools — so difficult to obtain today — last longer, cut better and quicker if kept always sharp. The HILCO Universal Tool & Cutter-Grinder costs only $495.00 F.O.B. Chicago, complete with Universal Index Dividing Head, step collars, ¼ hp. 110 volt universal motor, index fingers, grinding wheels, etc. Quick delivery.

Write for circular and full specifications.

BERCO MANUFACTURING CO. 423 W. Superior St. Chicago, Ill.

FLEXIBLE SHAFTS

Flexible shafts have gone a long way since the days when the only place we saw them was on the dentist's drill.

Firms who formerly supplied flexible shafts for such light duty now furnish them for all kinds of applications. Some are very heavy, and serve for important uses. Outstanding is their use for remote control applications on many different kinds of war equipment.

Possibly the best known flexible shaft units for industrial use are those with a motor on a pedestal, mounted on casters, to move about in the shop. Generally it can be used with attachments for grinding, wirebrushing, buffing, sanding, rotary filing, polishing, and even light drilling. One firm recently provided an angular head drilling shaft for use in tight locations. The drill may be held at either 45 or 90° with the shaft proper, according to type of head ordered by the customer. Both angles of heads are obtainable.

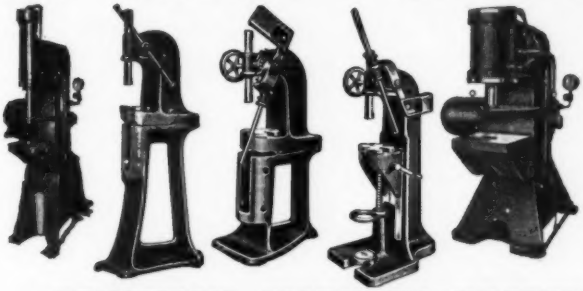
Do you know that one manufacturer of flexible shaft portable pedestal units designed one which can be readily applied to grinding precision work in the lathe? It is really a simple proposition. The grinding head which carries the wheel has facilities for attaching it directly to tool-post. Since it can be turned in any direction, any type of grinding, external or internal, may be accomplished by this method. It is one of those things which goes far in adding to lathe versatility.

There are firms furnishing many flexible shaft units chiefly in bench and suspension types. Both have many applications where portable pedestal units cannot be as readily applied. They are used with all kinds of materials and for many purposes.

Even more interesting for some shops is a design of flexible unit much used by toolmakers, combining a bench and suspension mounting. The basis of the unit is a swinging radial arm, mounted on a bench pedestal.

Doubtless, the war effort will produce many new applications involving use of flexible shafts.

For AIRCRAFT and MUNITIONS



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65 Standard Styles and Sizes. Manually operated presses ¼ to 35 tons pressure. Motor driven hydraulic presses 1½ to 30 tons pressure.

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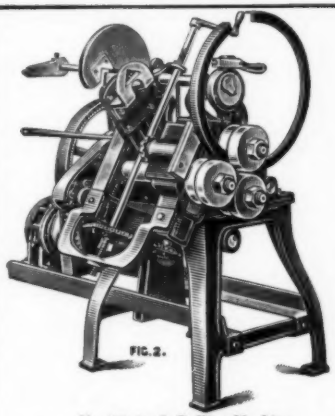

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CAPACITY—2"x2"x¼" ANGLE

HERE IS A
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THAT HAS FOUND ITS WAY INTO
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SHIPS—PLANES—TANKS—AUTOMOBILES—ENGINES—FURNACES—FARM MACHINES AND METAL PRODUCTS OF ALL KINDS
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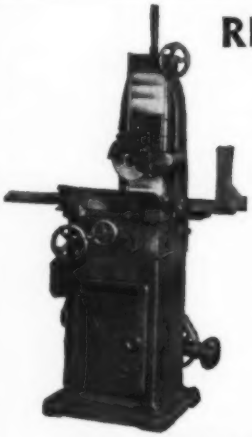
Phone Elizabeth 3-0523—After 5 p. m. to 9 a. m., Elizabeth 2-9519



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FOR *Victory!*

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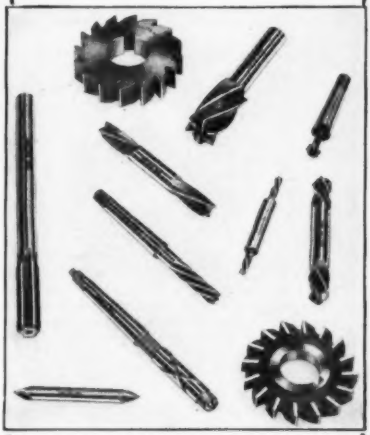

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At Your Service for Special Tools, Dies, Jigs and Fixtures Made to Your Exacting Requirements.

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Write for prices on standard sizes or submit blueprints for special sizes.

Galter Manufacturing Co.
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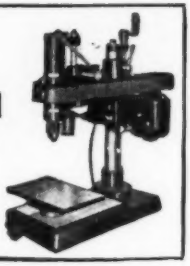
The HAMILTON MUEHLMATT Super Sensitive DRILLING MACHINE

TINY HOLES LOOM LARGE IN PRODUCTION



FOR TINY HOLES
.004 to 5/16' dia.

The smaller the hole the more important is precision drilling . . in this machine you can depend on precisely accurate results . . . always.

THE HAMILTON TOOL CO.
Ninth and Hanover Streets.
HAMILTON OHIO

AUTOMATIC BUCKER

Bucking and riveting simultaneously are now possible with an automatic bucker announced by Aero Tool Co., Burbank, Cal. With it one woman can do work otherwise requiring 2 operators, riveting airplane and other sheet metal parts. Primary advantages claimed are light weight and ease in handling, 50% reduction in labor costs and better riveting in less time.

Aero Tool Automatic Bucker with 22" throat weighs 14 lbs; with 36" throat, 16 lbs., including gun. They are used with any standard rivet gun and can be furnished with specially designed heads for any type of aircraft construction. Due to the exclusive design and construction of this tool, it is claimed, rivets are driven instantly in perfect alignment, eliminating crooked rivets with measurable reduction of rejects and reworks.

Parallel yokes provide for side panels, wings and leading edges, with special yokes for engine cowling and other parts requiring extra clearance. On horizontal structures, rivets can be pre-loaded. On vertical structures rivets can be inserted in the usual manner or can be pre-loaded and taped. There is no yoke deflection. High grade seamless tubing and alloy steel castings are used. Opening and travel of Bucking Bar are limited only by the accessibility of the part to be riveted.

These tools have been tested, proved, and are now in use in a large aircraft plant.

CLOSED TRADE AUTOM MARK CLOSED

Plain Type — Offset Type

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CONTINUOUS HINGES

All hinges shown can be furnished with special holes, cutouts and bends to blue-print in metals to suit the job.

AUTO MOULDING & MFG. CO.
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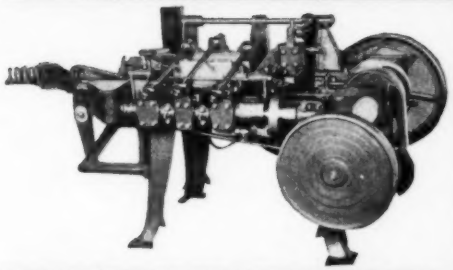
SPECIFICATIONS:
Open Width 1/8" *to* 6"
Gage Material .040 *to* .125
Pin Diameter .101 *to* 3/8
Lengths to 120"

THREE-FOURTHS OFFSET — SEMI-OFFSET

TO MEET TODAY'S *INDUSTRIAL REQUIREMENTS*

THE NILSON AUTOMATIC METAL AND WIRE FORMING MACHINE



The Nilson Automatic Metal and Wire Forming Machine meets today's industrial requirements. Here are some of the features of this machine: Open construction of press and forming tools. Patented slide feed with an independent cam-operated wire gripping device. Power operating wire feed is transmitted through a straight line.

Write today for information

The A. H. NILSON Machine Co.
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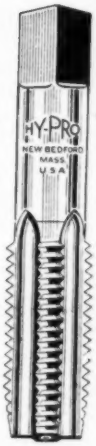
HY-PRO
Reg. U.S. Pat. Office



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High Speed Steel Hand & Machine Screw Taps

Cut Thread; Commercial and Precision Ground Thread Taps, Special Taps.

Clean, Sharp Threads for High Production

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—SPEED— YOUR RIVETING OPERATIONS

A great help in War Production, these **GRANT** Riveters are available in Noiseless Spinning and Vibrating Hammer types, also Vertical and Horizontal Multiple Spindle Spinning Machines.

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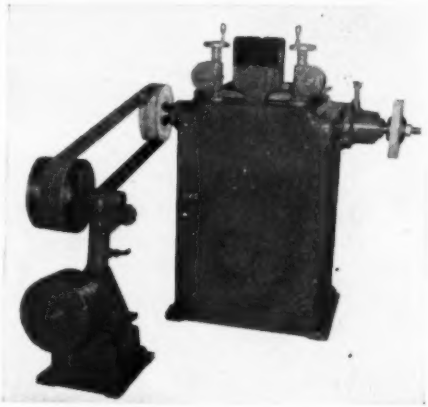
The Idler Backstand In Belt Sanding

The "Backstand" is probably one of the most revolutionary trends in sanding work today. Startling results are reported from plant after plant where old-fashioned set-up wheels are being changed over to this modern sanding equipment which is so much more simple in its operation and so far superior in its accomplishments, according to Behr-Manning Corp., Troy, N. Y., who manufacture the abrasive belts but not the Backstand fixtures.



The Backstand is merely an idler pulley on a shaft or base. It obtains its motive power from an abrasive belt, operating over a drive pulley and thus becomes part of a belt sanding machine.

An Idler Backstand may be large or small and may be set up on the bench, the floor, the wall or the ceiling. Models most commonly used are the bench type for small work and the floor type for larger pieces.

Generally a plant will have one or more abrasive set-up wheels (felt wheels surfaced with abrasive grain) running from 4 to 20" in diameter, which are used for cutting down, finishing or polishing metal parts. The change to a Backstand can be made in a short while; moreover, it can be made to accommodate whatever space is available.

Among the many and exceptional advantages gained in numerous war industries through adopting Idler Backstands and Metalite Cloth abrasive belts are the controlled coating of modern abrasive cloth; the faster dissipation of heat; the range of 15 grit sizes; the ease and rapidity of changing belts; the reduced loss of abrasive grain and the retention of desired cushion in contact wheels. The slow, lumbering output of old-fashioned methods really cannot be compared with the use of the Backstand equipped with factory-made abrasive belts, supplied in exact specifications to meet any and every condition encountered in each individual plant.

Allen Power Bench Type Punch Press

A Small punch press for small work.

Height 17½". Base 8½x8½"
Flywheel 10" D. Wt. 28 lb.
Stroke ¾"
Capacity soft iron ¾"Dx⅛"
Weight 120 lb.
Power required ¼ to ½ H. P.

Price $125.00

Circular on request.

Alva F. Allen, Clinton, Mo.

NEW CALIPER
SPEEDS UP DEFENSE WORK

Direct Reading Accurate, Fast, Simple. New timely tool SAVES TIME, SPEEDS UP PRODUCTION. Graduated scale, easily read at a glance. Adaptable to all types, shapes of work, wood or metal. Measures 0 to 4 inch.

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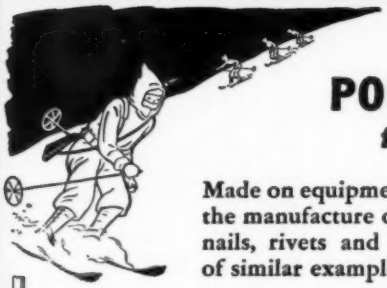

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for example

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SPECIAL NAILS RIVETS SCREWS

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SPEED UP FINAL OPERATIONS ON DIES, GEARS, SCREWS, LONG RODS AND SHAFTS WITH COLBORNE *Speed Lathes*

GOOD DELIVERY

For economical polishing, lapping or finishing of gears, shafts, dies, gages, ball races, long rods, etc.

Built to meet the requirements of those desiring a heavy constructed, smooth running machine of highest quality.

Has large built in motor with variable speed control, using REEVES standard pulley and belt.

Smooth automatic brakes act instantly when switch is thrown. Collets or chuck may be used.

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BUILDERS SINCE 1879

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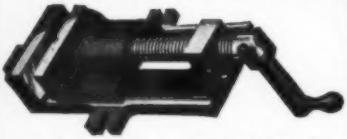
YOST DRILL PRESS VISE



This new Yost vise has been designed expressly for use on drill press operations. Does away with special and costly jig fixtures.

Offered in two sizes.

Vise No.	Width of Jaw, Inches	Opens Inches	Weight Pounds
1D	3½	3½	12½
2D	5	5½	23

Do you need a vise of ANY type?

Write today for bulletins on the extensive Yost line

YOST MFG. COMPANY
1335 SO. MAIN ST.
MEADVILLE, PENNSYLVANIA

BURKE
MILLING MACHINES
Make Fast Work of Small Jobs

Motor Driven

Timken roller or ball bearings to spindle

Write today for circulars.

Burke Machine Tool Co.
297 E. 16th St., Conneaut, Ohio

SURFACE ENGINEERING SERVICE

Establishment of a free engineering and laboratory service through which ordnance makers and other manufacturers of mechanical parts may obtain precise readings on flatness and profile, has been announced by L.P. Jackson, Vice President in charge of Engineering, Mid-West Abrasive Co., 1960 E. Milwaukee Ave., Detroit.

The new service, is designed primarily to assist ordnance manufacturers who have to cope with rigid government specifications on finish and tolerances. However, it is offered gratis to any manufacturer who requires such readings and does not have measuring equipment on hand.

The laboratory located in the company's Detroit plant, Mr. Jackson says, is equipped to measure accurately depth of scratch down to one-tenth of a micro-inch or to determine promptly whether or not any given part is optically flat. In event a part is found to be not optically flat, the laboratory will make it flat if that is requested by users of the service. There will be no charge.

The service includes return of the part along with readings and complete technical data on the grain, grade, tool speed, coolant and pressure recommended to produce the required finish. Users of Mid-West service are asked merely to furnish the sample part and identification of the metal therein.

DIAMOND WHEEL DATA

Plain, cup type, metal-bonded diamond wheels, as specialized in by DiaTool, Inc., Yonkers, N.Y., are listed with full specifications and suggested applications, in a new leaflet just announced.

Extreme density of diamond concentration (400 in all wheels) is advanced as affording faster grinding with minimum effort and longer wheel-life, thru decreased load per diamond particle. Density, according to the feaflet is so great that diamond particles actually touch each other.

Metallic matrices, holding diamonds in place, are said to be strongly made, keeping the diamonds cutting efficiently until they are worn out. This feature, the firm claims, also makes for sturdiness, longer life as well as for resistance to unintentional abuse.

Another point emphasized by the firm's wheel design is reinforced outside edge, and matrix, including diamonds drawn over the side or periphery of the wheel.

Installing Machinery in your Plant?

SYNTRON

REG. TRADE MARK

ELECTRIC HAMMERS

Drill
Anchor Bolt Holes
in Concrete

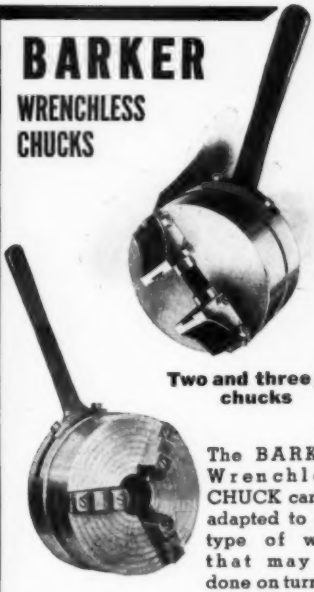
Quickly—Easily—and Economically with their 3600 Powerful Blows per Minute

Write for your copy of our new catalog No. 430.

SYNTRON CO.
300 No. Lexington Ave., Homer City, Pa.

BARKER

WRENCHLESS CHUCKS



Two and three jaw chucks

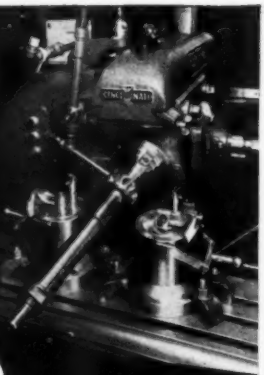
The BARKER Wrenchless CHUCK can be adapted to any type of work that may be done on turrets, engine lathes, semi-automatics or pipe threading and cutting off machines. They require no accessories to install, and a quick movement of the lever releases or grips the work.

Users everywhere are getting high percentage increases in production. Well adapted for a diversified line, from small brass castings to forgings.

Write for Catalog

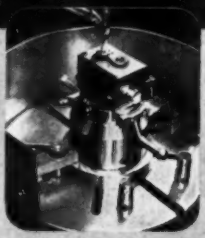
THOMAS HOIST CO.
Chuck Division
24 So. Hoyne Ave.
CHICAGO, ILLINOIS

NEW WAYS OF
Hiking Production, Cutting Costs,
WITH
ZAGAR
FIXTURES



• The illustration above shows two 2" Zagar Holding Fixtures mounted on a Cincinnati production milling machine. One universal joint is cut while another is being loaded. The fixtures have standard tap holes to fasten special locating brackets. Production rate — 23 pieces per hour, No. 4140 steel, aircraft quality, about 1-3/8" diameter. The operator has time to burr all pieces completely.

Ask for a copy of our well illustrated Bulletin B-1



In this case production was doubled by using a 2" Zagar Indexing Fixture with a special drill jig for drilling and loading simultaneously.

ZAGAR TOOL, INC.
23880 Lakeland Blvd. Cleveland, Ohio

mounted on the cross-slide, provides tooling for cheeking and filleting operations, as well as for turning.

While crankshafts nearly always pertain to engine design, they have been found helpful in other cases. One such is in press design, as used by an outstanding builder. In a large suspension press, equal pressure is applied simultaneously to all 4 corners of the press slide, eliminating any tilting. Pressure is applied by using 4 cranks on 2 parallel crankshafts for the purpose. When work chances to be placed off-center in such a press, the action of the press remains true.

Proper chucking of crankshafts for turning their different parts is complex. It s a problem that cannot be discussed here at any length. It is interesting to know, however, that hydraulically - operated crankshaft chucks, for turning pins, facing cheeks and contours, and rough-turning line bearings of auto crankshafts, have been developed for use on a machine made by a crankshaft machinery specialist. These include necessary hydraulic cylinders for operation.

One phase of crankshaft operations, both important and ticklish, is straightening. This job has been shorn of many of its terrors by a sensitive-control hydraulic press designed for such duty. It has a pressure control that is exceedingly sensitive.

CRANKSHAFT OPERATIONS

Huge crankshafts for heavy duty Diesel application, having line bearings up to 8 or 10" in diameter, require massive lathes. One that recently appeared accommodates crankshafts as long as 16', and the builder is ready to equip such lathes with even longer beds if required. With crankshafts of this length, even though bearing diameters are large, care must be used to guard against deflection in thte turning operation. Therefore, a back roller-rest is used against the back of the bearing being machined. It is contained in a heavy housing, and may be moved along the lathe-bed to any position. A 3-way turret,

• • • •

BUY WAR BONDS AND STAMPS

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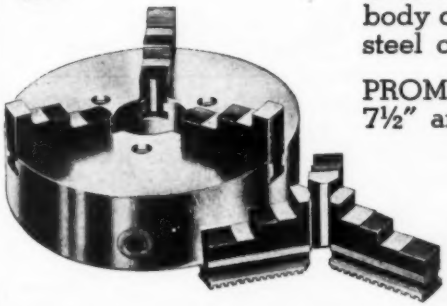
Almond



LATHE CHUCKS

UNIVERSAL GEARED SCROLL

Manufactured in sizes from 4" to 15". Solid one piece body construction in semi-steel castings.

PROMPT DELIVERY! on 7½" and 9" Chucks.

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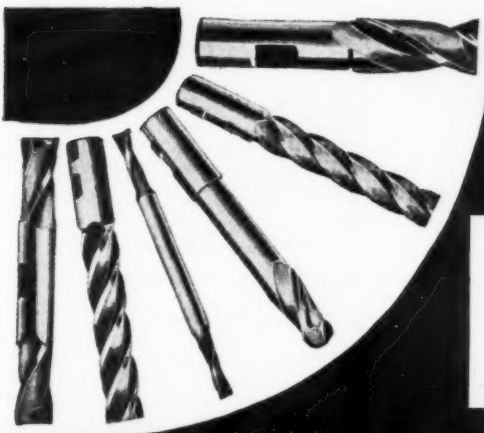

Shear Cut— High Speed

END MILLS

Shear Cut End Mills are offered in all standard sizes, single and double end.

Write for catalog and prices today.

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PRODUCTIMETERS

on the Production Front

On machines producing war materials for the boys on the fighting front, Productimeters give accurate count, provide exact figures for control, prevent waste, save vital man-hours.

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TANNEWITZ *High Speed*
METAL CUTTING BAND SAWS

Fastest and best known means of cutting sheet steel, aluminum and magnesium sprues, gates, risers, and kindred items. Provides saw blade travel of over 2 miles per minute with perfect safety. Cuts are exceptionally smooth. Labor savings ranging from 25% to 90% are the usual thing.

For complete details simply write for bulletin on metal cutting band saws.

Built by Sawing Machinery Specialists

THE TANNEWITZ WORKS
GRAND RAPIDS, MICHIGAN

NEW GEAR PROCESS

Details of a revolutionary new process for the manufacture of gears, which not only eliminates practically all machining but also saves half of the steel normally needed per gear, were revealed at the ASTE Milwaukee War Production Exhibition.

The process, developed by Tool Engineers of a Detroit manufacturer is already

5000 SHAPES AND SIZES GROBET Swiss Files

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The most complete catalog of its kind. Lists 5000 different shapes, sizes and cuts of GROBET Precision Swiss Files. Ask also for catalog WM on files for filing machines.

Learn more about these Chrome Steel Files that have won a reputation for utmost precision and durability.

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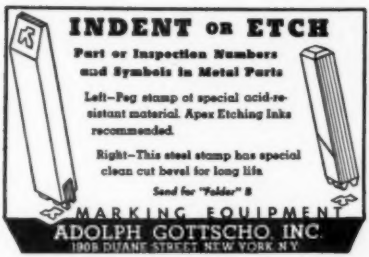
INDENT OR ETCH
Part or Inspection Numbers and Symbols in Metal Parts
Left—Peg stamp of special acid-resistant material. Apex Etching Inks recommended.
Right—This steel stamp has special clean cut bevel for long life
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MARKING EQUIPMENT
ADOLPH GOTTSCHO, INC.
190B DUANE STREET, NEW YORK, N.Y.

Vernon
6" UNIVERSAL INDEX CENTERS
Head swivels and locks from 10° below horizontal to 10° past perpendicular. Spindle taper #9B&S. The 3 index plates provided will divide all numbers to 50 and all even numbers to 100 (except 96T).
Write for bulletin.
MACHINERY MANUFACTURING COMPANY
Vernon Line of HORIZONTAL MILLS, VERTICAL MILLS and JIG BORERS, SHAPERS and GRINDERS

being applied to production of pinion gears for military vehicles. With this new process, it is reported, gears are forged or coined on presses, complete with gear teeth, the process being so accurate that the gears—even after heat-treating—are held to a thousandth of an inch.

Standard practice up to now has been to forge "blanks" of steel, into which the teeth are cut by a generating process—frequently requiring a roughing and a finish machining operation. The specialized equipment needed for generating such gears has been difficult to obtain.

In the illustration, R. R. Nathan, Chairman of the W.P.B. Planning Committee (right) is discussing the process with Willard F. Rockwell, Board Chairman of Timken Detroit Axle Co., where the new process was developed. Mr. Nathan is holding one of the new gears already in production for army vehicles and the small "billet" of steel from which the gear is produced to finished size in giant forging presses. Mr. Rockwell is holding the same type of gear and the large blank from which such gears were previously machined.

JOHN'S DRILL JIGS FOR TAPPING MACHINES

These jigs are now provided with universal jaws which permit quick set-up for end drilling and tapping.

The reversible V plates accommodate a large range of diameters.

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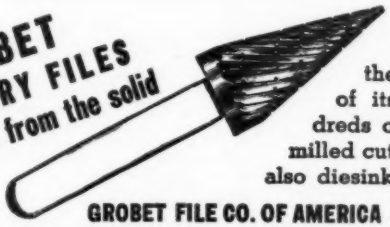

GROBET ROTARY FILES ground from the solid

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the most complete catalog of its kind, illustrating hundreds of rotary files hand cut, milled cut, ground from the solid; also diesinkers' burs.

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AMEs
UPRIGHT GAUGE No. 13
The model best suited for general testing and measuring in thousandths inches or less. Base is 8 inches square. Capacity for measuring to 6 inches. Weight 17 pounds.
Price $30.00
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to tool life. Not only have manufacturers of cutting lubricants in general been telling us this for years; they have proved it in countless cases. But it is one thing to have a proper cutting lubricant, and another to have it properly and adequately applied. A coolant pump that permits adjustment of flow is of particular value, giving copious flow for heavy cuts where needed, and allowing flow to be reduced in cases where only a light cut is to be made. One line of centrifugal coolant pumps allows the stream to be varied from full down to dripping.

Tool wear can be greatly reduced in many cases by proper use of chromium plating. Most of us know how chromium plating is used for salvaging worn tools and restoring to size. One method deals with what its sponsor is pleased to call "Pre-salvaging," that is, the coating of tools with chromium plating before putting them to initial use. This holds out a great deal of promise.

End-cutting tools wear endwise. Such wearing endwise, and non-uniformly, destroys alignment of tools when used on a multiple-spindle machine with reference to a number of them cutting to even depth. The cure? Adjustable extension tool holders which compensate for such wear as necessary.

* * * * *

THE WOUNDED CAN'T WAIT—GIVE TO THE RED CROSS!

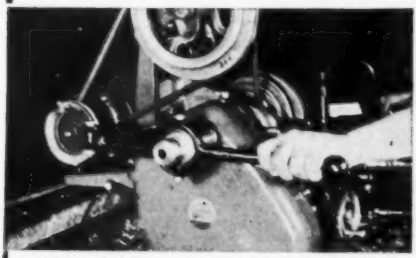
* * * * * *

TOOL WEAR

Tool wear has always taken a heavy toll in various ways. It has been much lessened by attacking the problem from different angles. One of these is use of better tool materials as they are found adaptable. Take, as a case in point, the use of the carbides and new highspeed cutting alloys that allow higher speeds with less tool wear, and with consequent greater length of tool life. There are many places where this and other cutting alloys have meant a great saving in tool wear.

Most of us know that use of proper types of coolant or cutting lubricant adds

LATHE PRODUCTION Will be Increased



WITH THE RECOR LEVER COLLET CLOSER

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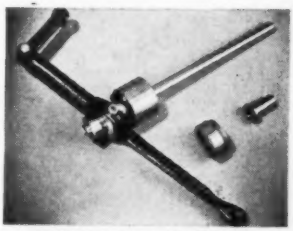
FEED AND RELEASE BAR STOCK THRU THE COLLET WITHOUT STOPPING LATHE

Easily attached to Logan, S. B., Atlas bench lathes having a No. 3 Morse Taper in the head stock. Will feed any length stock from 1/64" to ½" through the spindle, but step collets can be made to accommodate larger diameters and used for second operations only.

Gripping action is adjustable to desired tension without loss of time.

The ReCor Lever Collet Closer is precision machined from finest materials obtainable and will last indefinitely. All parts hardened and ground where necessary. Cam is mounted in a ball bearing to insure smooth running. *Write or wire today for details.*



Collet Closer with fittings ready for installation

10 DAY DELIVERY

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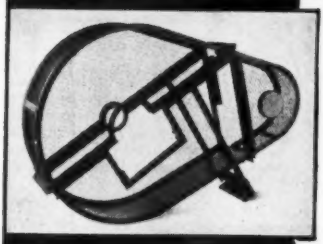
LITTLEFORD GEAR GUARDS



If you have gears, chain drives, etc., exposed, cover them with a Littleford Gear Guard; cut down accidents and lost man hours by playing safe. Send blueprints today for prices and delivery date.

BUY WAR BONDS AND STAMPS

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LITTLEFORD BROS. Inc.
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ATLANTIC

No. 2 Automatic Precision

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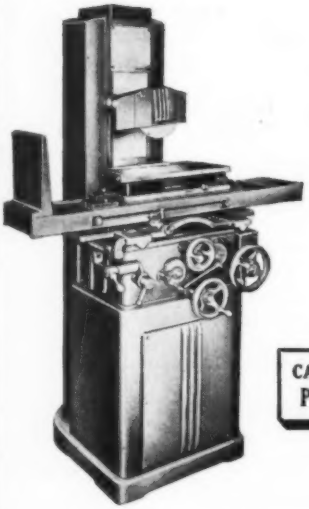


ANTI-FRICTION
SELF-CONTAINED
PRECISION
GRINDER
SPINDLE

CAPACITY 6" x 12" x 18"
PROMPT DELIVERIES

ATLANTIC MACHINERY CORP.
149 BROADWAY, NEW YORK, N. Y.

CUTTING OILS

More aid to production is often involved in the use of a good cutting oil, and in selection of the right oil for the right place, than is often realized. In the case of bullet assembling machines, where excessive heat was generated, there was one instance where it was necessary to use low machine speed. Even then tool life was short.

Changing over to an emulsifying cutting oil, supplied by a specialist in this line, increased tool life 40% and stepped up production a like amount. Such gains constitute a remarkable contribution to the war effort. It might well pay many of us to make a close check on all operations where heat generation is great.

A good cutting oil required in one place may not be what is needed in another. Proper combinations of ingredients in cutting oils have been carefully studied by some of the firms specializing in metal-working lubricants.

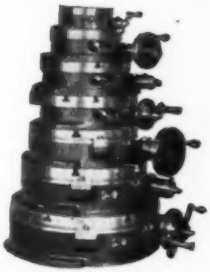
Obviously, it is much safer not to guess at this matter, but to call in a representative from some firm which has had wide experience. Such firms have combinations of ingredients for various jobs which have been proved over a period of time as being scientifically correct. One cannot do better than to adopt the one they advise.

An instance of an automatic screw machine engaged on molybdenum - steel aircraft screw production has been noted, in which change of cutting oils increased the life of the tools by 25%, and produced as good a finish as had been obtained before. Such tool life increase is practically always based on keeping down heat or dissipating it quickly.

There are other advantages. Chip welding is prevented, finish is in many cases improved, and tool adjustment is much reduced.

Have you ever considered adding a germicide to your cutting oils, to eliminate foul cutting oil odors, and to guard against dermatitis? There are those who provide germicides for this purpose. They will guarantee to maintain your cutting oil sterility, if used according to directions.

TROYKE ROTARY TABLES



Sizes 9', 12', 15' and 18'.
Ask your dealer or write us for eight page catalog.

ALFRED A. TROYKE
4422 Appleton St., Cincinnati, O.

PADDOCK
Ball Bearing
BANDSAW GUIDES

•

Reduce Blade Breakage
Increase Production

Easily adjusted to all sizes of blades to 1½' wide.
Recommended for new and old machines running at any speed cutting all materials.

Shipped on 10 day approval

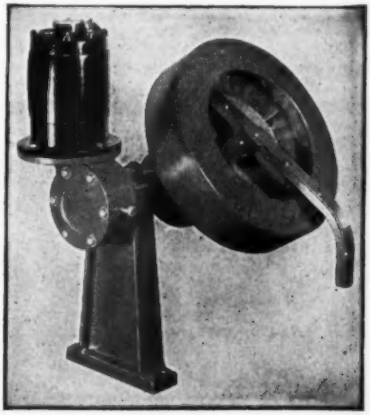
PADDOCK TOOL CO.
1418 Walnut St., Kansas City, Mo.

HOPPERS
THE FASTEST FEEDING HOPPER EVER DESIGNED

Feeds Screws, Screw Blanks, Nuts, Rivets, Pins, Bearing Rollers, Plain Washers, Discs, Bullet Cores, Special Parts.

Hoppers Adaptable To Any Machine.

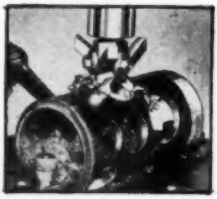
Send Sample Parts For Feeding Speed.



DETROIT POWER SCREWDRIVER CO.
2809 W. FORT ST., DETROIT, MICH.

Clark Adjustable Hole Cutters, make clean, precision cuts to any diameter from ¾" to 4½", to depths of ¾" in stainless steel, pipe, plastics, hard fibre and other materials with ease, speed and accuracy. Clark 3-blade Adjustable Hole Cutters with additional High Speed Tool Bit Sets reduce inventory, save time and cash. Used with portable hand drills and various machine tools. State your hole cutting problems. Ask for new Bulletin. No. MTBB-4

Cutting Bulkheads



Cutting Radial Surfaces

Robert H. Clark Co.

3424 SUNSET BOULEVARD, LOS ANGELES, CALIFORNIA

MANUFACTURERS...PRECISION TOOLS...PRECISION PARTS

PORTABLE GRINDING

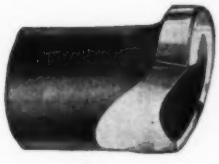
Thoughts of portable grinding usually bring to mind portable grinding machines.

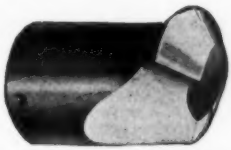
What is in mind here is not these so much, as the grinding elements or "teeth" adapted to such machines. Mounted wheels and points are an instance. They are being appreciated more and more. Capable of being used in highspeed grinders of air, flexible shaft, or electric type, they are lightening countless tasks around "tight corners." One firm providing such tools in a set of various popular shapes, includes with the set a silicon carbide stone. This is used either for dressing these little wheels to keep them sharp, or for changing their shapes if need be. They have nickel-plated spindles. Some firms provide mounted wheels in surprising range of shapes, grains, grades and sizes, enough to catalog them for ready reference.

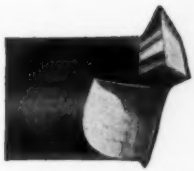
Coated abrasive cloth, as it applies to various portable grinding or abrasive tools, is an element of great importance. It is chiefly used in production of smooth, level surfaces. The manner of machine on which it is used is often determined by degree of polish wanted in the finished job. Portable disk grinders of coated abrasive type may be used, or it may be one of the modern sanders or reciprocating pad rubbing machines. The latter will do a smoother job. Either is good for the work to which it is adapted. Regardless of the machine or the duty, some makers of coated abrasives furnish abrasive cloth exactly suited to the job.

How about grinding wheels on portable grinders for snagging duty? Some larger users determine the best wheel from the pure production standpoint by running comparative tests. Some prominent makers give close attention toward designing production ability into their wheels, for this purpose. But that is not the complete picture. Some, who produce cup wheels for the purpose, use wire ring supports to strengthen the thinnest part of the cup, and incorporate other special strengthening features.

GIVE A DAY'S PAY TO RED CROSS!







Grinding Never Changes Form of BOKUM BORING TOOLS

- Resharpening confined to one face
- Free cutting action always retained
- Tools stand greater feed
- Increased feed will not shatter tool

The angle of the cutting edge and the special helical backed-off form of the front of tool produces a free-cutting action unaffected by resharpening.
The greatest cutting force is always directed toward the largest cross section of the cutting tool, which enables tool to accept much more feed than is possible with any other boring tools.
Since the angle at which the tool removes material is not at right angles to the stock, a smoother bore, true to size, is always produced.

Carbide tipped tools also available.

Send for Catalog H-1139.

All sizes shipped from stock

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Anderson

BALANCING WAYS

If you handle rotating parts in your shop, consider this simple, sturdy and thoroughly dependable device for balancing, straightening and truing operations. It assures better work in less time and with less labor.

Four chilled iron discs rotate with minimum friction on sensitive special bearings, giving a quick, accurate indication of whether or not the work is in perfect balance.

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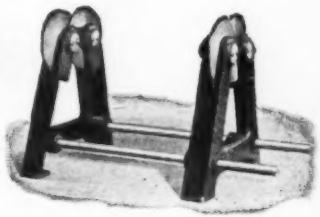
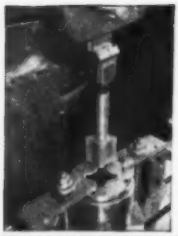
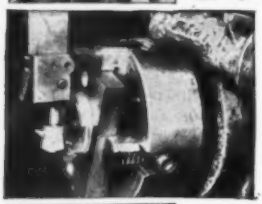


Swing	Greatest Distance Between Standards	Capacity in lbs.
20 in.	20 in.	1,000
40 in.	30 in.	2,000
60 in.	30 in.	2,000
72 in.	66 in.	5,000
96 in.	88 in.	10,000

ANDERSON BROS. MFG. CO.
1917 KISHWAUKEE ST., ROCKFORD, ILL.





4 of the many ways . . . SLOTMASTER can be used to save TOOLS & SET-UPS

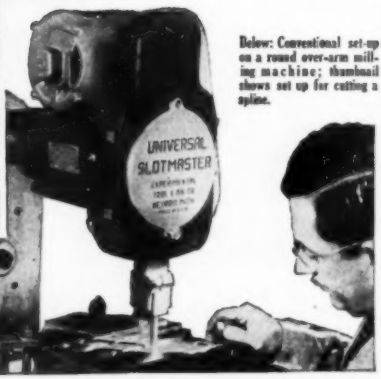
Left: Set-up for lapping deep impression die.

Below: Set-up for cutting an internal gear

SLOTMASTER can be used on any round or flat-on round over-arm milling machine and will do precision work that normally requires a multi-thousand dollar machine (all of the working parts are of tool steel, heat treated). It takes but little time to change over from one head to the other . . the stroke of the ram is adjustable from 0 to 4½ . . the speeds range from 50 to 250 s.p.m. The tool holder is of the clapper box type and can be turned in any position . . SLOTMASTER comes complete with pulleys, motor, mounting bracket, etc. Send for 4-page catalog—give specifications of the milling machines you wish to equip. Immediate deliveries on high priorities.

Experimental Tool & Die Co.

12607 Greiner **Detroit, Michigan**



Below: Conventional set-up on a round over-arm milling machine; thumbnail shows set up for cutting a spline.

PLASTIC BEARINGS

A tough plastic, used by the Army for helmet liners, has been drafted for sea duty to improve efficiency of Uncle Sam's submarine chasers and other light vessels. The plastic, called Micarta, is being made into bearings for propeller shafts, replacing scarce rubber, bronze, and babbitt bearing materials. Made of layers of fibrous material bonded together with synthetic resins, Micarta is supplanting, in some ships, bearings made of lignum vitae, a heavy wood, which often cracked under the pounding of rigorous service and stormy seas.

The use of Micarta for propeller bearings, according to V.E. Enz, marine engineer at the Trafford, Pa., plant, Westinghouse Electric and Mfg. Co., is no mere wartime substitution. He believes the plastic will permanently replace other bearing materials because it wears longer, causes less friction and is unaffected by sea water. Naval vessels now stay on active duty longer without dry-docking for bearing repairs. The bearings are made by wedging staves of Micarta into a cylindrical metal shell and boring the plastic to fit the propeller shaft. Grooves are cut lengthwise in the plastic to allow sea water to enter and act as a lubricant.

Salt water corrodes metal bearings, but only makes Micarta smoother and almost frictionless. Rubber bearings resist corrosion, too, but they cause considerably more friction than the plastic, thus slowing down the vessel.

Both lignum vitae and Micarta bearings were installed on a twin screw merchant ship at the same time and removed three years later. It was found that wood had worn nine times at much as the plastic, and the shaft which turned on Micarta showed no wear while the other shaft was one-fifth of an inch smaller in diameter.

Micarta bearings are being installed on the Navy's subchasers, escort vessels, mine sweepers, fleet tugs, landing and oil barges, small transports, power boats and salvage vessels. These bearings are also helping to keep our merchant fleet at sea. Some have seen over 7 years of service.

FULLER'S *Mar-Proof* MALLETS

For all Assembly Work — Automotive, Sheet Metal, Furniture, Printers. Replaces rawhide and rubber. Will not mar surfaces or machine parts. Shock Proof. Genuine Hickory Handles.

SOLID AMBER MALLET **CAST BODY—REPLACEABLE TIPS**

	Diameter	Length	Weight
No. 100	¾"	3½" Curved	4 Oz.
No. 101	1 "	3¾" Curved	5 Oz.
No. 102	1¼"	4 " Curved	6 Oz.
No. 103	1½"	4¼" Straight	8 Oz.
No. 104	1¾"	4½" Straight	10 Oz.
No. 105	2 "	4¾" Straight	13 Oz.

To renew, saw off worn surface. Pat. Pending.

No. 259 1" Face
No. 269 1-3/16" Face
No. 279 1-5/16" Face
No. 259T 1"
Replacement Tips

No. 269T 1-3/16"
Replacement Tips
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Replacement Tips

Immediate Delivery Through Your Regular Hardware Supplier. Write Us For the Name of Nearest Source.

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*Drill Jig Bushings — Optical Flats — Monochromatic Lamps — Plain Plug and Ring Gages — Contract Flat Lapping.

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Makers of Hardened and Ground Precision Parts

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CARBIDE TOOL GRINDERS

NEW 6"
BELTED
MODEL

For fast and accurate silicon carbide or diamond wheel grinding the new Hammond Model 6-B Carbide Tool Grinder is multi V-belt driven. V-belt drive plus precision spindle dampens motor vibration and provides true, smooth running wheels. Wheels wear longer and grind faster because the Hammond 6-B gives you velvet-smooth operation. Write for Bulletin No. 202.

ANY ELECTRICAL SPECIFICATIONS AVAILABLE

Hammond Machinery Builders INC.
KALAMAZOO, MICHIGAN
1614 DOUGLAS AVENUE
Eastern Branch - 71 W. 23rd St., New York, N. Y.

REPRODUCTION

To produce a few identical pieces like a given pattern, where one would presume dies to be required, and then to discover a method of doing the work which will require no dies, sounds too good to be true.

Yet it is a fact that by the use of a group of small machines devised for this purpose, such jobs can often be done. One of the little machines is a brake, another a small shear, and the third a special bender. A great variety of work can be done, forming angle, channel, tube, rod, molding, wire and strip stock, let alone mention of various shearing and trimming jobs.

How about the proposition of making just a light soft pattern, model or template, and then reproducing the form of the template in a very heavy cut in die-sinking or profiling operations?

Did you know that machines for doing this have been developed? There is such a reproducing machine, especially for large, heavy work on blanking and forming dies. A magnetic tracer mechanism controls automatic operation of the machine. Despite the fact that the cut may be very heavy, none of the thrust of the cut can be transmitted to the tracer. Such machines are built in different sizes. Hand control may be used instead of automatic control, or an intermediate, semi - automatic type of operation may be selected.

Such copying is being further developed all the time. An hydraulic type of follower or tracer can now be obtained for application to milling machines, lathes, shapers, boring mills and planers. This device, using only a thin, easily made template as a guide, reproduces, according to the manufacturer, airplane propellers, cams of odd shape for firing control, landing gear parts, knuckle joints, gun and tank parts of various kinds.

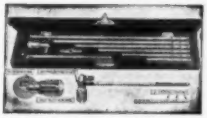
Remarkable records are being established with machines fitted out with follower attachments of this type.

M & L
PRECISION TAPPER

Taps guided by precision leads. Class 3 & 4 specifications easily met. 4 speeds. Ball bearings throughout. Available as floor model (with coolant system) or table model.

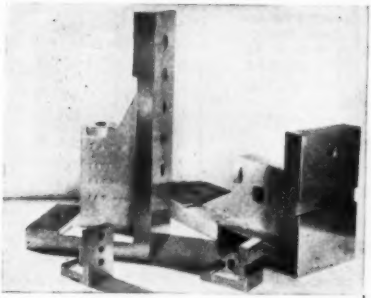
International Inside Micrometers

Highest accuracy and finest workmanship. Available 1½"—6" & 1½"—12" sets.



Brand Telescope Gauges ½"—2½"
Handy Knurler, used like pair of pliers.

BRAND TOOL & SUPPLY CO.
344 No. Vermont Ave., Los Angeles, Cal.



Patent Pending

Angle Plates for, Boring Mills, Drills, Grinders, Layout, Inspectors. Surface and Lapping Plates. Prompt Delivery.

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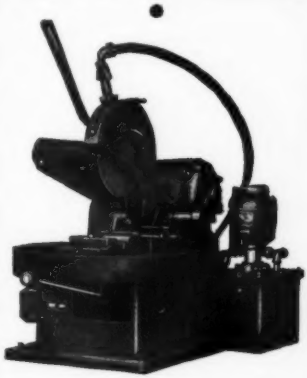
BRIDGEPORT NO. 47W WET CUT-OFF MACHINE



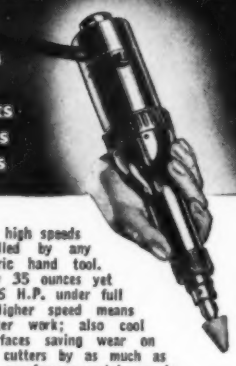
More, better and cheaper cuts on practically all materials, are produced by the new Bridgeport "Abrasaw". Cutting speeds are unbelievably fast, material is handled with facility and the polished cuts often eliminate secondary operations.

LET US SEND BULLETIN GIVING DETAILS.

BRIDGEPORT
SAFETY EMERY WHEEL CO. INC.
1304 W. BROAD ST. BRIDGEPORT, CONN.

SUPER POWER
EXTRA SPEED

GRINDS
MILLS
ENGRAVES
POLISHES
FINISHES



1/6 H. P.
35,000 R. P. M.
Weighs only
35 oz.

Operates at high speeds never equalled by any other electric hand tool. Weighs only 35 ounces yet develops 1/6 H.P. under full load. ● Higher speed means faster, better work; also cool working surfaces saving wear on wheels and cutters by as much as 50%. Cuts non-ferrous metals up to 350 Brinell hardness without heat.

WRITE TODAY FOR BULLETIN No. 73

No vibration. ***Guaranteed shock-proof without ground wire.*** Practically unbreakable Bakelite case is shaped to fit the hand. Women doing war work use it long hours without fatigue. Only three parts; no screws. Four ball bearings sealed in grease retaining chambers. Tool mounts in stand, vise, or lathe and operates on AC or DC.

New COOLFLEX flexible shaft attachment extends full power and speed of the PRECISE 35 to the small, cool-running handpiece. Only PRECISE 35 offers this advanced feature.

PRECISE PRODUCTS CORPORATION
717 Racine St. ◆ Racine, Wisconsin

THE PRECISE 35

FILING OPERATIONS

In some respects filing operations have been so long established along given lines it is difficult to believe that they could be much improved. And yet, new developments in filing are taking place continually.

Most of us are acquainted with the fact that files have been developed for working special materials and metals. They continue to make their appearance. Not so long ago, there appeared a new line of files designed for use on naval bronze. Such are of especial significance at present, since they bear on the war effort.

Special rotary files have been developed to be used in a drill press chuck, for filing clearance on punches. A file of this kind, with just enough taper to file an accurate break clearance, and capable of negotiating curves, in common with any rotary file, is interesting. Ordinarily we think of rotary filing as being a flexible shaft or portable tool job strictly. But now we find this is not the case, valuable as such applications may be.

On the other hand, for a long time we thought of portable tool filing as strictly rotary. This idea, too, has been exploded by developments, during recent years. A portable air-powered filing tool of pistol type developed some years ago, capable of making 500 to 5,000 strokes per minute, was among the first reciprocating portable files. It pointed the way to fast cleaning-up in many tight corners, fairly eating out excess metal, and soon established a definite place for itself.

More recently, another pistol-type reciprocating file came into the industrial lime-light, tho it was electrical. For finishing cavities in dies, cleaning steel and iron castings, and even more particularly cleaning small die castings, it has proved itself highly useful. Still a third, chiefly useful for filing, has also been used to advantage for honing, polishing and sawing, when equipped with the required accessories.

(Note—Machines mentioned and makers identified on request.—Ed.)

SPEED UP TOOLING—CUT COSTS

with the **UNIVERSAL VISE**

Save tooling time. Build your fixtures around a completely pre-designed drill jig body.

Save production costs. Savings up to 60% in drilling time not uncommon. Lever locks work instantly—holds securely. Throw it back and work is released. No complicated adjustments. Save cost of expensive drill fixtures—just a bushing plate and adaptor needed for each job.

Order today. Please include contract number or priority certificate. *Write for bulletin.*

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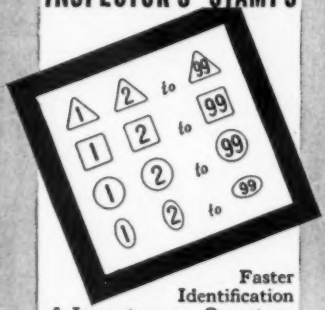
130 N. Union Ave. Chicago, Ill.

New

INSPECTOR'S STAMPS



Faster Identification of Inspectors or Operators. Different borders may be used for different shifts. Available in 4 sizes. Write for prices today.

NEW METHOD STEEL STAMPS, Inc.
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WATER removed from AIRLINES AUTOMATICALLY WITH THE MURPHY SEPARATOR

Sizes ½" to 4" Pipe

Literature and Prices on request.

RESULTS — — — — GUARANTEED
NO ABSORBENTS — NO CHEMICALS

JAS. A. MURPHY & CO.
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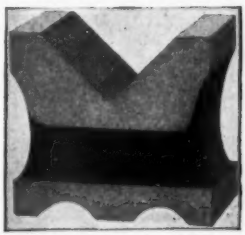
"TRU-V" BLOCKS



Why Not Save Time—by having enough V-Blocks available at all times in your shop to avoid the delays involved in make-shift set-ups and tie-ups?

"TRU-V" Cast-Iron Blocks are available in nine sizes—from 3½ to 10", in three styles. Each block is carefully machined on all sides, with close limits held within .001" where required. A machined ledge on both sides provides for clamping on machine bed.

Let us send descriptive bulletin.
Or contact your mill supply dealer.

Oliver Motorcraft Corp.
2532 S. Wabash Ave., Chicago, Ill.

Precision *dependable for longest service* is insured by DUBLIFE. A new plug end, either "Go" or "No Go" is ready when used end is worn. Easily reversed. Bronze split collet locks ends in same handle. Sizes: .030 to 1". UPPCO lapped for hardest finish.

ASK FOR CATALOG OF COMPLETE LINE

Other gages of American Gage Design also shown. Write

UNITED PRECISION PRODUCTS CO.
3522 West Belmont Ave. Chicago, Ill.

CASTING RECLAMATION

Intricate castings having thin and thick sections are especially subject to warpage while cooling. Though patternmakers have become adept at allowing for the amount and direction of warping in advance, variation occurs.

An interesting phase of this is that castings made of the malleable type may be straightened cold. Many of them are straightened perfectly. Some use drop hammers and dies for such straightening. Some straighten them by hand on surface plates. In some cases, a good hydraulic press, equipped with proper dies, has been used for this purpose to the best advantage.

Then there is the matter of porous castings. Foundrymen know that inclusion of nickel with the melt overcomes porosity. But with castings of lower price, and where there is sufficient porosity to invite corrosion from sea water, alkalies, acids or ammonia, the logical thing to consider is sealing. Varnishes have been developed for this purpose, which will bake properly at temperatures of 250 to 300 degrees F., and overcome porosity. Thus, another casting reclamation problem has been satisfactorily solved.

Whenever we think of cracked castings of large, expensive type like engine block castings, we naturally think of welding as the only practical means of reclaiming them. That is perfectly right. The problem has been to weld such castings and still avoid setting up internal stresses after the weld has cooled. Often it has been necessary to pre-heat entire large bodies of metal, to avoid a heavy expansion differential at the weld proper, with subsequent stress from cooling and probable re-cracking.

Recently developed low-temperature welding alloys are solving this problem on many jobs.

With relatively low temperature held at the weld, a high degree of pre-heating is unnecessary.

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100 PAGES

of information on
47 Speed Reducers
1/50 to 10 H. P.

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SLOW SPEED gear motors, .08 to 1140 r.p.m., in 47 sizes from 1/50 to 10 H.P., are described and priced in this 100 page catalog, in such a simplified manner that any one can easily select the correct machine for almost any application.

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Janette Manufacturing Co
556-558 W. Monroe St.
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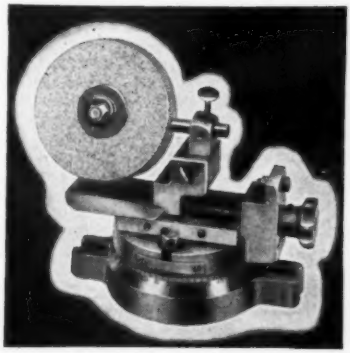
Radii & Angle Dresser Distributors Wanted



Immediate Delivery

Complete Price **$90.00**

Manufactured by

Jack Tool Co., 18901 Conant, Detroit, Mich.

No Saw Welding
Instant Internal Sawing

Unsurpassed in speed, efficiency and accuracy of sawing small and medium sized dies as well as miscellaneous parts.

THE TOOLMAKER'S BEST FRIEND

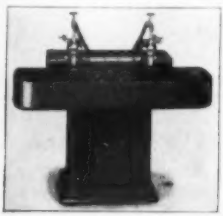
Write or wire for details and prices

GROB BROTHERS
GRAFTON WISCONSIN

THERE'S NO DUST HERE

Grinding dust and grit ruins lungs and machinery. Hisey Wet Grinders keep it from getting there. And you don't need a big clumsy exhauster and air filter.

The steady adjustable flow of water carries with it all dust and grit generated by grinding and prevents burning the tool. The large pan and specially designed tool rests eliminate splash.



Made in sizes with 10 to 30" diameter wheels. Also made for drill grinding, single wheel types, and combination wet and dry with one wheel for snagging grinding. V-Belt drive assures correct speed for any size wheel.

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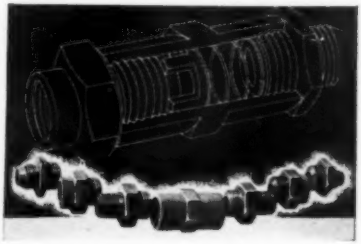
Hisey THE HISEY-WOLF MACHINE CO CINCINNATI, OHIO.

Asp Universal Check Valves



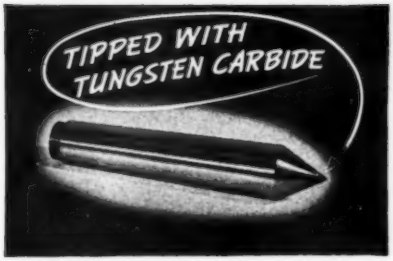
A new type Universal Check Valve that allows 12 combinations to be made with one body and any two of three types of adapters is now in production at the American Screw Products, Los Angeles, Cal., under the trade name "Asp."

Designed primarily for installation in airplane hydraulic lines, the valve is claimed by the manufacturer to be lighter and to have increased in flow capacity with corresponding reduction in back pressure.

A phenolic poppet seats at either end of the valve body. Adapters are available for flared tubing or external and internal pipe threads. Made in all standard tubing sizes of heat treated aluminum alloy, a standard body can be assembled with two of three types of adapters to meet the requirements of any combination of tubing or pipe connections or directions of fluid flow.

Laboratory tests to 50,000 reciprocations at variable temperatures up to 75 F are claimed to have developed no breakdown or distortion. It is also asserted that the valve is unaffected by vibration, variable pressures, or acceleration, and that it provides positive protection in critical lines. It is manufactured to Army Air Corps, AN and Navy specifications.

The design of a standard body with the use of adapters is said to result in a marked decrease in inventory stock.



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Tamaloy Carbide Tips • Tipped Tools
Tipped Lathe Centers • Tipped Drills
Gages • Speedaloy Tool Bits.

THESE LATHE CENTERS LAST 50 TO 100 TIMES LONGER

The tip of these precisely ground lathe and grinding centers are made of Tamaloy tungsten carbide which is 50 to 100 times more resistant to wear and galling than high speed steel. By using these centers you will cut down your replacement costs and greatly improve the accuracy of your machines.

STANDARD CENTERS

Morse Taper	Price Each
No. 1	$ 3.00
No. 2	5.00
No. 3	8.00
No. 4	12.00
No. 5	18.00

Prices on Brown & Sharpe, Jarno and special centers on request.

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TUNGSTEN ALLOY MFG. CO. • 65 COLDEN ST., NEWARK, N. J.
Formerly Circle Tip Tool Co.
TUNGSTEN CARBIDE SPECIALISTS

FOR
SMITH SURFACE PLATES
SEE PAGE 210

These precision lapping plates feature the basic elliptical design that characterizes all Smith Surface Plates. Designed for developing a true plane of close tolerance, insuring a perfect fit when lapping metal-to-metal joints, and all other uses requiring accurately flat lapped surfaces. Cutting surface comprised of a series of diamond shaped areas. Prompt delivery on standard sizes ranging from 8" x 12" to 48" x 96". For prices and delivery write, phone or wire.

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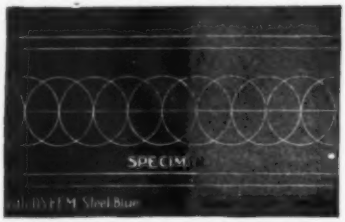
Precision Measuring Equipment
854 N. Sandusky Ave., Bucyrus, O.



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making dies & templates

Simply brush on, right at the bench; ready for the layout in a few minutes. The dark blue background makes the scribed layout lines show up in sharp relief, and at the same time prevents metal glare. Increases efficiency and accuracy.

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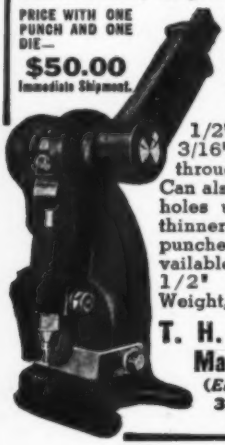
BENCH PUNCH

Built for hard, tough work—die cannot lose alignment with punch—all parts interchangeable.

PRICE WITH ONE PUNCH AND ONE DIE—

$50.00

Immediate Shipment.



Capacity—1/2" holes through 3/16" steel; 13/32" through 1/4" steel. Can also be made for holes up to 7/8" in thinner metal. Stock punches and dies available from 1/16" to 1/2" by 64ths. Weight, 70 lbs.

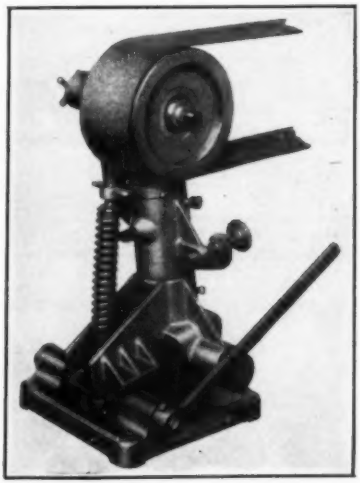
T. H. Lewthwaite Machine Co.

(Est. 1890)

311 E. 47th St., NEW YORK

MATTISON IDLER STAND AND PULLEY

Present grinding and polishing lathes can be adapted easily to the use of factory-coated abrasive belts at a small investment by adding a Mattison No. J-135 Abrasive Belt Idler Stand and Pulley. The stand is placed at the rear of the lathe, permitting use of an abrasive belt running over a contact roll or wheel on the lathe, and traveling back around the idler pulley. With this arrangement, grinding is done on the belt, instead of the set-up wheel.



The Mattison J-135 Stand is of substantial construction thruout. Ball bearing idler pulley is mounted on yoke, which can be swiveled by handwheel to align pulley with belt. Handwheel adjustment controls position of belt on pulleys. A cam arrangement is provided for easy changing of belts.

Entire assembly swings on a hinge shaft mounted on the base. Slack in the abrasive belt is automatically taken up by sensitive spring tension; and the spring is adjustable to suit various types of work. Stand is adjustable for either right or left hand by turning column and upper assembly halfway around. Address Mattison Machine Works, Rockford, Ill. for further details.

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BY USING S&S HINGES

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S & S MACHINE WORKS

HARDWARE DIVISION

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Lead screw ground from the solid AFTER hardening

CRITERION *Boring Head*

SMOOTH and compact. Constant accuracy. Parts subject to wear are hardened. Large offset adjustment eliminates need for offset boring bars. Lead screw is hardened tool steel. Its threads are ground from the solid AFTER hardening.

Criterion heads are unexcellent in accuracy, in ability to withstand constant use. Two sizes 1¼" and 3". ½" and 1" bar capacity. Order from your dealer or write direct. Request free literature. No obligation.

CRITERION
MACHINE WORKS
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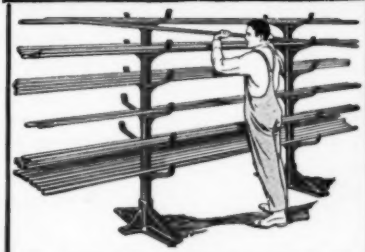
A TIME SAVER



The BROWN SECTIONAL RACK

saves the time wasted end-hauling stock from the old-style, closed-side rack and quickens the selection of sizes by greater visibility. Built of standard metal sections: can be expanded for changes in stock or growth of business. Made in 5 styles: can't burn, depreciation practically nil.

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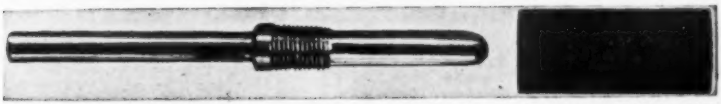
BROWN ENGINEERING CO. 126 N. THIRD ST. READING, PA.

FLEXIBLE ABRASIVE WHEELS

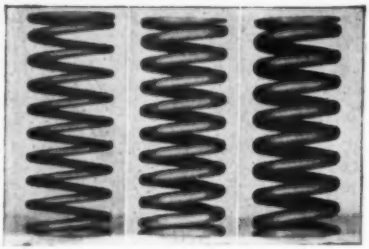


Designed for precision work where flexibility is required, these wheels are useful accessories for sanding and finishing regular and irregular jobs, penetrating into difficult recesses, lapping holes in dies, finishing various shapes of metal, wood, rubber and plastic parts.

Useful for finishing propellers in aircraft construction. Descriptive bulletin and sample wheel will be sent on request. Prompt Deliveries.

FIELD ABRASIVE SPECIALTY MFG. CO.

203 LOWE BLDG., DAYTON, OHIO



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DIE SPRINGS

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J. R. Fitzsimmons W. H. Fitzsimmons Jos. T. Fitzsimmons

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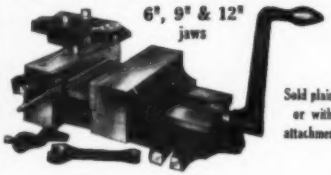
GRAHAM MULTI-PURPOSE VISE



DOES MANY JOBS ON MANY MACHINES

With its various attachments, this vise holds a wide variety of work, and eliminates the need for special jigs or fixtures on many repeat-operation jobs. The various sizes serve practically all vise requirements for drill press, radial, shaper, miller, planer, grinder. Also sold plain, drilled for attachments.

ASK ABOUT OUR KNURL HOLDER FITTING LATHE TURRET

Request Illustrated Price Circulars

GRAHAM MFG. CO.

58 Bridge St. East Greenwich, R. I.

Thor Announces Plastic Drill

Announcement of a new Thor plastic ¼" portable electric drill is made by Independent Pneumatic Tool Co., Chicago, after nearly a year during which large qauntities of the drills have been produced under Army contract.

The grip handle, field case and gear case of the drill are constructed of a new, tough, light weight "Thorite" plastic.

With military requirements on exclusive production of the drill now completed, the tool is for the first time made available to all war industries.

According to the Thor Engineering Department, tests of the plastic drill have proven it to have more power per pound, greater strength and protection from shock, and to be more compact, lighter in weight, and cooler to handle.

The plastic, streamlined housings have been supplied to the Army in an olive drab color, but will be in maroon for general use.

NEW LOW COST

DRILL GRINDER

Anyone can do expert drill grinding with this simple-to-use drill grinding attachment—fits on any bench grinder—saves buying new twist drills—saves time and materials that dull bits waste. Grinds bits from 3/16 to 1¼. Write for FREE literature.

T & H MFG. CO.
811 E. 31 St.
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SHOP BOX
A straight side shop box with rigid handle and hook hole each end. Excellent for shop use where stacking feature is not required.

STACKING BOXES
An ideal all-purpose shop box. Sturdy all-welded construction. Heavy skids act as a positive stacking lock and reinforce box at point of maximum wear.

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STEEL BOXES FOR YOUR PRODUCTION NEEDS

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No. 401—10″x16″x6″—18 Gauge, each, $ .85
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FACTORY, PHILADELPHIA
ANY QUANTITY.

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Save Time In Cutting Sheet Metal!

GES ELECTRIC HAND SHEARS

BIG CAPACITY

Cuts 14-Gauge Sheet Steel or 16-Gauge Stainless

Fast-cutting, light, and powerful. Cuts accurately to the line—not only along straight lines, but also around small curves. Light and easy to handle, but sturdily built to stand hard service.

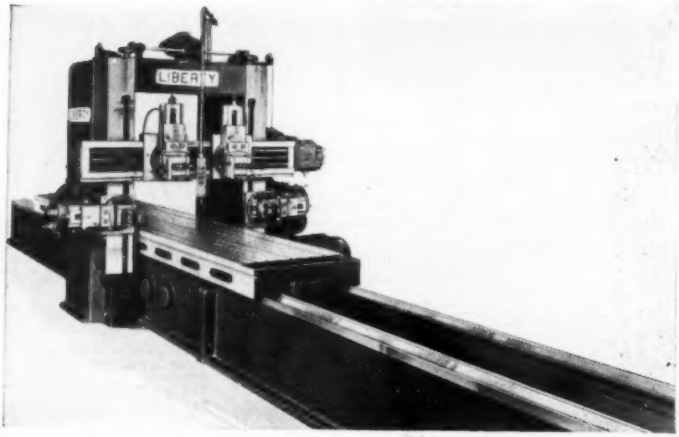
Alloy steel cutters will cut 6½ feet of 14-gauge sheet steel per minute. Ball bearing "Grip" type Universal motor, ⅛ horse power, either AC or DC, and 110 or 220 volts, 25 to 60 cycles. Fuse protection incorporated in switch box.

Now Available for War Production

James W. George Machinery Company
3146 E. Jefferson Detroit, Mich.

WRITE FOR LITERATURE

Liberty Offers New 48x48" Medium Duty Planer



A new Medium Duty Liberty Planer has been designed to meet the needs of shops whose work cannot be handled by small standard duty machines and where large, heavy duty and slightly more elaborate planers would be unnecessary. These planers are in production right now, at Liberty Planers, Inc., 1014 Weller Ave., Hamilton, O., and deliveries are good.

Bed is of double length of box type construction with cross walls well ribbed and with bottom mounting flanges. Bed vees are pressure lubricated. Heavy box type table has T slots machined from solid. Housings are of extra heavy box type bolted and doweled to bed. A deep heavily ribbed cross brace is provided on top of housing. Faces of housings are extra wide providing large bearing surfaces for cross rail.

Cross rail is individually motorized for elevating. Face of cross rail provides wide bearing surface for rail head saddles. Friction feed and rapid traversing mechanism for rail head are oil bathed in dust proof housing conveniently located along with simplified control, at end of rail.

The two rail heads are extra strong. Four-way power feed control with micrometer adjustment is provided for both vertical and horizontal feeds. Also power rapid traverse full length of cross rail. Clapper boxes have wedge type clamping devices. Each rail head is equipped with a pneumatic tool lifter.

SIGNODE

HOLD SAFE

Save Time and Weight on MACHINE SHIPMENTS

SIGNODE ANCHOR STRAP

Special applications of Signode Anchor Strap are being made for machinery and machine tool manufacturers. Manufactured parts, complete assemblies are anchored and reinforced for greater shipping safety in boxes or crates, or on skids.

Let a Signode representative tell you how to save critical lumber and cut freight weights. Write us today.

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Signode Steel Strapping Meets All Federal Strapping Specifications

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- Self energizing
- Slip proof
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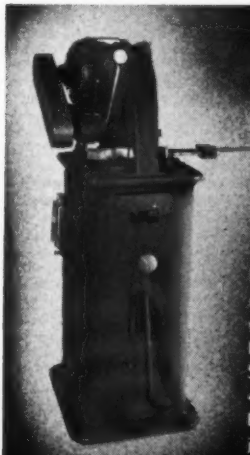
Write or wire for Bulletin DC 42-4H

THE K. O. LEE COMPANY
ABERDEEN, SOUTH DAKOTA



THE CATSKILL

MODEL "D-2" ABRASIVE CUT-OFF MACHINE

The new model "D-2" Catskill Abrasive Cut-Off Machine embodies all the features essential to fast, abrasive cutting, as well as many new features.

Designed as a dry unit, the pedestal base is so arranged as to permit the use of a coolant system for wet cutting. Available with slower speed motor for high speed steel saw cutting of non-ferrous metal. Swivel vise of V block type allows cuts from right to 45 degree angles, and can be rapidly locked in place. Equipped with stop gage. Work is held by adjustable jaw vise, foot operated.

★ ★ ★ **THE CATSKILL METAL WORKS, INC.**
CATSKILL, NEW YORK

AMERICAN MEASURING INSTRUMENTS CORPORATION

Announce their removal to:

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where augmented facilities, efforts and skills will be, as in the past, at the disposal of their clients.

American Measuring Instruments Corporation

240 West 40th Street New York City

Manufacturers of Indicating Gauges, Plug Ring Snap Gauges, Jigs, Fixtures, and Measuring Instruments.

AMIC PRECISION INDICATING GAUGE

Planers come equipped with side heads on both left and right hand housings. They are extra strong and are counterbalanced. Individual motor, power feed and rapid traversing mechanism are mounted integrally with head. Power feed and power rapid traversing up and down are provided. Infeed of side head tool is operated manually. Friction feed is immersed in oil.

Drive gearing, always operating in a bath of oil, is composed of triple semi-steel secondary gearing and a steel high speed herringbone primary drive.

Automatic table operation is thru inching type pendant switch, available to operator from both sides of planer. Electrically operated limit and slow down switches permit machining of deep shoulders and blind pockets reversing to a line.

Unit is driven by a 30 hp d-c variable voltage reversing motor, 40 to 1200 rpm with generator set and controls to operate at 3 phase, 60 cycles, 220 or 440 volts. This provides a range of table feed from approximately five to 150 fpm.

Bulletin No. 155 gives full information and detail illustrations.

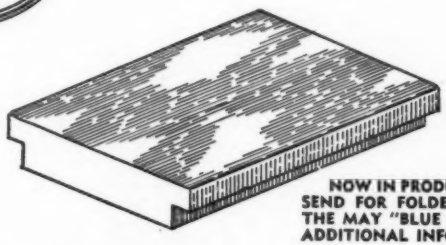
SELAS BURNER BULLETIN

"Selas Superheat Burners, High-Speed Concentrated Heat Sources Fueled With Gas and Air Only"—A new 8-page 2-color catalog, No. 251-B, (8½x11), 28 illustrations, introducing radical equipment for flame-hardening, flame-annealing, mechanized-brazing, preheating and other localized open heat treatments. Published by The Selas Co., Erie Ave., Philadelphia. Jobs being done, metallurgical advantages, and application & control technique are all discussed—as well as constructional details and operating principles. Full capacity and selection data are included. Diagrams describe special modifications of burners for particular war production jobs; photographs show various automatic "machine-tools-for-heat-treatment" designed around the new air-gas combustion technique. Applications to the production of gears, valve and mechanism parts, caterpillar treads, steel barrel and tank heads, blades, saws, camshafts, sprockets, cartridge cases, gun parts, armor piercing shot, and spun vessels, are mentioned.

GIVE A DAY'S PAY TO RED CROSS!

STEEL-O-ROCK

SURFACE PLATES



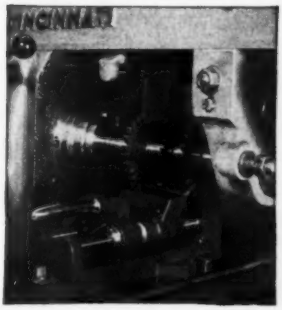
NOW IN PRODUCTION.
SEND FOR FOLDER AND SEE THE MAY "BLUE BOOK" FOR ADDITIONAL INFORMATION.

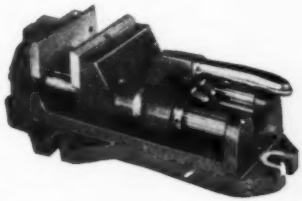
BARRE SURFACE PLATE CO.
20 PEMBERTON SQUARE - BOSTON, MASS.
PAT. APPLIED FOR

Firm Clamping *Without* Overpressure

A Production Vise With a Pressure Adjustment

There is never any danger of distorting soft metal parts if you use a Presto-Vise, because its jaw pressure can be adjusted to the type of metal that is being clamped. Once adjusted for a certain pressure, it stays adjusted, saving time on each operation, and also eliminating spoilage losses due to distortion of parts. Attachments furnished make it ideal also for use as a drill jig.





Free CATALOG

D. A. SMITH & CO.
8087 Livernois Detroit, Mich.

PRESTO-VISE

WANTED
Dealers - Distributors

In large and medium size manufacturing cities in East and Middle West to demonstrate and sell small precision machine tool to all types of machine and manufacturing shops. Must be above draft age, financially responsible and preferably experienced in machine tool line. This item is fast seller and big money maker.

Write—Machine Tool, c/o Box B-2

HITCHCOCK PUBLISHING COMPANY
542 S. Dearborn St., Chicago, Ill.

INDUSTRIAL 0-9 MILLING MACHINE

A new Vertical Milling Machine and Jig Borer known as the Industrial 0-9 is announced by Industrial Tool & Die Works, Inc., Minneapolis, Minn. This company has been engaged in the manufacture of ordnance, chiefly gages and precision equipment for the government. The machines were designed originally for use in their own tool rooms.

Machines are of the fixed bed type construction, with convenient working height to provide ample leg and foot room.

Six spindle speeds ranging from 300 to 3800 rpm are furnished. Another notable feature is the fast hand feed and worm feed to spindle.

The table drive and vertical spindle head drive rolls on anti-friction bearings.

There are four table feeds—¼, ½, ¾ and 1⅛"—giving adequate feeds for the sizes of work handled on this machine. The table feeds in both directions. Feed charges are controlled by hand wheel at left side of machine.

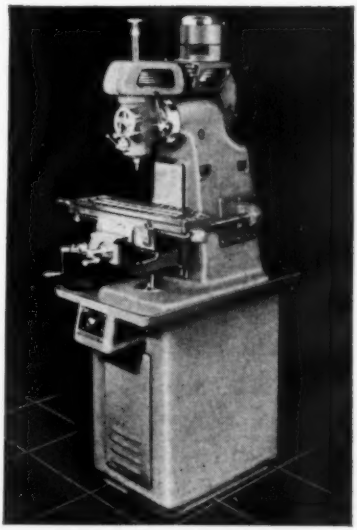
The head swivels 180 degrees.

Operation is simplified by the single independent directional lever for starting, stopping and reversing table movement.

Adjustable stops and micrometer adjustment are provided for all hand-feed movements of quill and vertical spindle head slide. This permits rapid, accurate positioning of the cutter to a predetermined relationship with work.

The vertical spindle head is of husky proportions. The makers emphasize that this dampens out vibrations and withstands heavy cutting loads. The heat treated alloy steel quill for vertical spindle is of large diameter, for added rigidity and maintenance of spindle alignment.

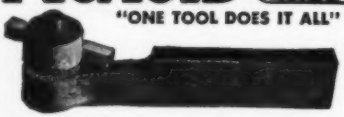
The compact design permits grouping of several machines in comparatively small space.



FlexoiD TOOL HOLDER *Universal Head*

Entire assembly including bit is rigidly locked by a single screw.

"ONE TOOL DOES IT ALL"



Does away with right, straight or left hand tool holders. No change in centers necessary when resetting—4 sizes.

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THE SMITH POWER TRANSMISSION CO. PST

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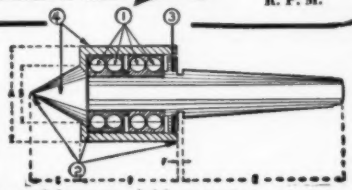
CLEVELAND, OHIO

QUADRO *PRECISION* LIVE CENTERS

5 REASONS *Why They Meet Every Specification:*

1. FOUR (4) ROWS of precision BEC-4 specification bearings.
2. Note SHORT OVERHANG assuring rigidity and accuracy—eliminates "chatter"
3. Positive FELT-SEAL—excludes dirt—retains lubrication.
4. HARDENED AND GROUND CONE—point accurate to within .0002.
5. HEAVY DUTY—Note Combined Radial Thrust Load at 100 R. P. M.

Morse Taper No.	A	B	C	D	E	Combined Radial-Thrust Load At 100 R.P.M.	Net Price
2	1⅝	⅛	⅝	1 11/16	2⅝	1600	$23.00
3	1⅞	⅛	⅝	1 11/16	3 1/16	3300	$25.00
4	2 1/16	3/16	13/16	1 13/16	4⅜	7500	$35.00
5	2 5/16	1⅜	1	2 1/16	5⅜	12000	$47.00



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FOR REMOVING BROKEN TAPS

Quickly—
Insert WALTON Tap Extractor and back out broken piece. No annealing—no drilling.

Easily—
Tap Extractor and Tap Wrench are only tools needed.

Safely—
Threads are not damaged. Not necessary to tap oversize after broken tap is removed.

Folder 131 gives complete details.

The Walton Co. 95 ALLYN STREET, HARTFORD, CONN.

LITTELL

CONTINUOUS STRAIGHTENING MACHINE *with Automatic Centering Reel*

For handling stock of various widths, at speeds of 10 to 60' per min. Portable. Compact. Fits into floor space 17x36". Machine shown equipped with Littell Automatic Centering Reel.

Control arm starts and stops motor and regulates loop of stock between feed and press. Either five or seven straightener rolls may be used. ¾ h. p., 1725 r. p. m., 60 cycle, 220 or 440-volt motor.

Other Littell products include Automatic Centering Reels, various other types of Feeds, Scrap Cutters and Winders, Pres-Vac Safety Feeders, Mechanical Pickers, etc. *REQUEST BULLETINS*

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SETTING THE PACE ON EVERY PRODUCTION FRONT

Saving 90% of clamping time—new designs for high speed production work, one hand operation. Non-creep replaceable grips, proof-tested alloy steel construction of forged clamp capacity. Screws, rods and handles **copper plated** against welding spatter.

A complete line of modern time-saving clamps—both malleable iron and alloy steel: Dual Grip "C" Clamps; Heavy Duty Speed Clamps; Standard DeLux; Standard Alloy-Steel; and Quick Lockset, the last word in modern clamp design.

Write today for circular

GRAND SPECIALTIES CO.
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GAGE HANDLES

PLUG AND TRI-LOCK

Handles will fit gages of standard size. Precision made for accuracy of fit and long life.

These steel handles are economically priced and can be had in any quantity.

Write for Further Details.

GREAT LAKES METAL SPECIALTY MFG. CO.

1450 West North Ave., Chicago, Illinois

All rotating parts, gears, sheaves, etc., are enclosed.

High pressure lubrication is provided to lengthen machine life. Built-in cutter coolant pump and piping are available at extra cost.

Table working surface is 24x6"; longitudinal power table movement is 12"; cross movement (hand only) is 6"; vertical travel of head is 3"; throat distance, centerline is 6½"; maximum distance from spindle nose to top of table is 8". Floor space required is 38x34". Approximate net weight, including electrical equipment is 850 lbs.

STANDARD REDESIGNS GRINDER

The Standard Electrical Tool Co., Dept. B-1, 2488 River Road, Cincinnati, Ohio, have re-designed their 14" Carbide Tool Grinder to incorporate the latest features, in substantial construction.

This machine is powered by a three hp, 1150 rpm motor, operated by magnetic reversing starter and separate triple push button station. Spindle ends are each equipped with heavy steel backing plate for mounting of the mechanically mounted cup type grinding wheels.

The new construction incorporates a rigid mounting for the work table at either side. The table is graduated and permits a 5° adjustment toward the wheel and 30° angle away from wheel.

Each wheel is protected by a guard of special construction with an adjustable shoe "A," or splash guard. This splash guard is adjusted by means of convenient hand screw "B."

Construction of the machine permits optional use for either dry or wet grinding, the wet grinding attachment being powered by individual motor drive and controlled by separate toggle switch.

Units are also available in the one hp 10" and two hp 12" sizes.

IMMEDIATE DELIVERY

TOOL POST TURRETS

FOR LATHES UP TO 16 INCH SWING. OTHERS BUILT TO YOUR SPECIFICATIONS

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UNITED AIRCRAFT PARTS MFG. CO.

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Industry's New Tool . . .

Mead Burring Machine

It is a time, labor and money saver on innumerable jobs in any shop. Sharpens tools, cutters, etc., of many kinds. Prompt shipment.

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ARTUS ARBOR SPACERS U. S. PAT.

Artus Spacers

Made of Plastic in thicknesses from .001" —.030". Each thickness can be identified by its color.

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Send for detailed circular and price list.

Industrial Products Suppliers

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THE basic needs of faster, smoother sawing and filing are met with the Oliver Die Making Machines. Operating efficiency is increased 50 to 60 per cent over hand methods in the making of precision dies, gages, cams, templates and similar products requiring rapid and accurate filing, sawing and lapping operations.

Send for literature describing the line of Oliver Die Making Machines!

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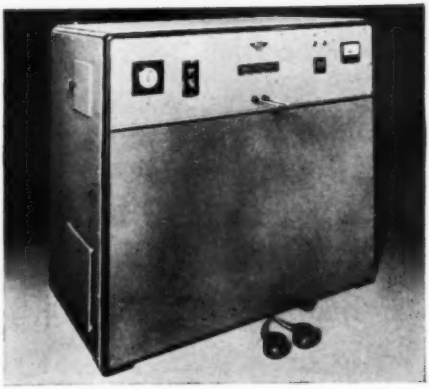
We also build Drill Grinders, Tool and Cutter Grinders, Face Mill Grinders, Template Tool Bit Grinders.

VAN NORMAN INDUCTION HEATING UNITS



The Van Norman Machine Tool Co., Springfield, Mass., announces two new Induction Heating Units for surface hardening, brazing, soldering and other heating applications requiring localized heat.

Available in two sizes, 16 Kw and 32Kw, these units are said to meet the average requirements of plants large and small.

Each machine is a completely enclosed unit readily adaptable for low cost hardening and heating of many parts manufactured in small lots, or it can be incorporated into any production line.

The units are easy to operate. The operator merely connects the proper heating coil for a particular job—sets the heat and quench cycle required—and piece after piece will be hardened, brazed, soldered, etc. in a few seconds, with identical results. To change from one job to another the operator simply changes the work-holding fixture and heating coil and resets the heating cycle to meet the new requirements. Since the entire heating operation is automatic, chance of human error is eliminated. Average shop workers, men or women, can readily learn how to operate the machines.

The makers assert there is practically no limit to applications for hardening, brazing, soldering, etc., within the work capacities of the units.

A fully descriptive bulletin containing the principles of operation, applications and advantages of induction heating is available.

DIAMONDS for Victory

IN STOCK—
READY for SHIPMENT
DT CO.—RE-SET-ABLE
Common Quality Diamonds
$12.00 per carat

No. 5-CN—7/16"—5/8"—For 6" to 10" Wheels
No. 6-CN—5/8"—11/16"—For 12", 14" and 18" Wheels
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No. CN-HD—3/16"—13/16"—For Heavy Duty
No. 4-CU—3/16" x 3", Also Diamond Sizes 2, 3, 5, 6, and 7
No. 5-CU—7/16" x 2", Also Diamond Sizes 3, 4, 6, 7, 8 and 9
No. 7-CU—1/2" x 2", Also Diamond Sizes 3, 4, 6, 8, and 9
Diamond weights stamped on each tool. Diamond size markings numbered in 1/4 carat graduations.
SPECIAL RE-SETTING SERVICE
Mailing Envelopes to Victory Plants on Request
Loc-Key-Set (Trademark Reg.)

No. 4-CU No. 7-CU
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DIAMOND TOOL CO. Not Inc.
Sheldon M. Booth, Pres.
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CONTOUR MACHINERY HANDBOOK

"DoAll Contour Saws" is the title of a new 265-page textbook which gives comprehensive data on the Art of Contour Machining, its cutting tools and the Do-All training program. Its contents are of special importance to industry and the machinist having Contour sawing and filing equipment. Latest technique for Contour Machining are included on such subjects as internal and external three dimensional parts for "short run" forgings, multiple identical parts in one operation for "short run" stampings and facilities for handling massive or small jobs as reported from the field.

Those not having contour machining equipment will find the book contains a wealth of information to help solve their shaping problems. A full 85 pages of the book show how contour machining replaced conventional machining to save both time and material on the production

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MARK PARTS, TOOLS, CAGES, DIES, FIXTURES, OR HARD FERROUS METAL & ALLOYS

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3 Sizes to Meet All Requirements

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Automatically Sharpens Metal Saws in gangs up to 8" in diameter. Takes gangs up to 3½" thick. The saws are automatically indexed and sharpened within variation of plus or minus .001 of exact diameter of entire lot.

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Jansson Gage Blocks—a good standard for precision measurement. Used by leading armaments manufacturers. Preferred by experienced inspectors for their extreme accuracy.
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for DIE MAKERS

Transfer Points Eliminate Guesswork in Die Making

There's no chance for error when you use transfer screws as markers in setting dies. Points are of uniform height above hex base. Six accurately made and hardened screws nest in a special holder with hex wrench tip. Made in ¼" to 1" diameters.

3/16"	$1.50 per set	5/16"	$1.25 per set	7/16"	$1.40 per set
1/4"	1.20 " "	3/8"	1.35 " "	1/2"	1.50 " "

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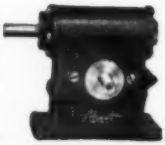

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Abart GEAR AND MACHINE CO.
MANUFACTURERS OF
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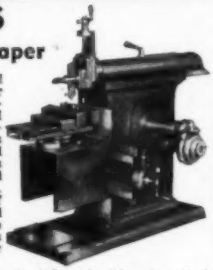
LEWIS
10" Metal Shaper



THIS easy-to-build PRECISION Shaper is accurately and efficiently serving in tool rooms and on production lines. Supplied as rough or semi-finished gray-iron castings plus necessary materials and construction blueprints. Costs but a fraction of a comparable finished machine and can be completed in far less than new-tool delivery time.

FEATURES: Head swivels 60° each side of vertical . . . Table swivels 90° each side of zero and is keyed for normal setting. . . Ram is rigidly supported and fully adjustable for stroke. . . Five automatic cross feeds adjustable in steps of .002". . . Large built-gear and pinion give efficient power transfer. Height 24", base 12" x 27".

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NEW LEWIS CATALOG gives full details on this and more than 20 other valuable shop tools. Write for your free copy today!

line as well as on special jobs. Another 26 pages illustrate and discuss methods used to find the best type of saw, saw velocity and feed pressure for cutting any material of any thickness most economically.

Over 80 percent of the text is shown through pictures with charts and diagrams giving easy access to proper speeds and feeds in the shaping of all basic materials: ferrous and non-ferrous metals and alloys, plastics, wood, fiber board, rubber, etc.

A 44 page section gives specific information on machine tools and machine shop practice for the student or learner.

The textbook is shop coat-pocket size, bound in the conventional manner with blue embossed covers to resist smudging and wear from hard usage. It is now being distributed free by the DoAll Service Office, 1206 Thacker St., Des Plaines, Ill., to industry, training schools and public libraries.

NEW FORGING AGENTS

Hot forging processes, particularly in shell production, are said to be aided by an agent swabbed or sprayed on punches, mandrels and rings to prevent carbon build-up and scratches while promoting speed and die life. E. F. Houghton & Co., 303 W. Lehigh Ave., Philadelphia, has developed a series of Hot Forging Agents which are meeting the demands of munitions production schedules. To meet these requirements, the necessary graphite content, high flash point and wetting out action are claimed to be combined in an agent which will not build up on the ram or cause scoring.

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—A REALLY PRECISION DIVIDING HEAD IN THE SMALL TOOL FIELD.

Standard 40 To 1 Ratio.
6½" To 11" Swing.
Universal Swivel Base, both planes calibrated in degrees.

Plus 3 EXCLUSIVE FEATURES

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3—Life-time NO-BACK-LASH adjustment of worm and worm-gear.

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Now in use by Army, Navy, Boards of Education, Aircraft plants and other precision tool and machine shops. Needed in every Tool Room!

WRITE NOW FOR DESCRIPTIVE FOLDER AND ATTRACTIVE PRICE AND DELIVERY

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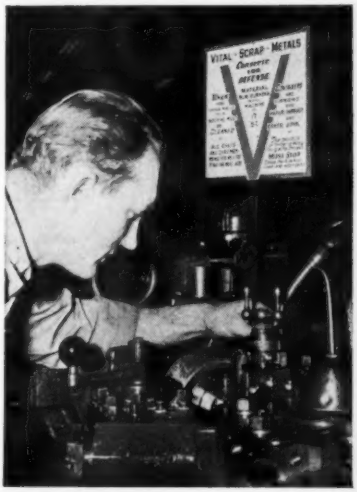
SALVAGING VALUABLE SCRAP

"V" is for Victory and also for salVage at Bendix Aviation, Ltd. The problem of conserving critical scrap metals has been made easier at this plant through the use of the "V" sign, a unique directional method for machine operators.

Worked out by Ernie King, Shop Supt., the sign warns—"When you change material your machine must be cleaned. Remove all chips and shavings before starting next job. Containers are furnished for paper, garbage and other junk. The practice of throwing everything in the chip pan must stop. Chips must be kept clean and segregated."

When an operator is assigned to a job the "V" sign is issued with the blue print and instruction card. The operator determines from the blueprint, the metal or alloy to be salvaged and indicates it on the "V" card, which is then posted over his machine. Upon completion of the job, the chips and shavings are collected by a specially trained maintenance man who checks the metal and removes it to the proper bin in the rear of the plant.

The "V" sign method of scrap segregation together with other savings in machining operations are reported to have made it possible for Bendix Aviation, Ltd., to achieve savings of as much as 50 per cent in its metal conservation drive.



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No matter what size or shape work is, Parker Vises grip it evenly, firmly, with accurately controlled, dependable pressure. Precision-built, Parkers respond to the slightest turn of the handle. No "slack" to take up when gripping or releasing!

In many plants where a slip means a reject . . . valuable production time lost, critical materials wasted . . . Parker Vises are helping workers hold down rejects because of these and other important features. The Charles Parker Co., Meriden, Conn., U. S. A.

Handled by Leading Distributors

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AMERICA'S OLDEST

JEFFERSON "BULLDOG"

Combining fast, accurate production with ease of operation, these machines are said to be capable of obtaining close tolerance and of handling a large volume of work. Low-cost performance in die sinking, contour profiling, angular milling, jig boring, routing—practically all essential milling operations—on ferrous and non-ferrous metals is claimed.

Table 15" x 4½" is equipped with ½" T-Slot and longitudinal feed. Table, knee and saddle have positive locking arrangement. Collet capacity ½".

Further to increase usefulness and scope, they can be equipped with a variety of standard attachments: Longitudinal travel, 8"; traverse, 3⅜"; vertical travel, 5¾"; working surface, 15" x 4½". Four spindle speeds, 200, 400, 700, 1,000 rpm. Center to table (max.), 6⅜"; Height over all (floor type), 53", (Bench type, 24"); Floor space occupied, 22" x 19" Shipping weight, floor type, 500 lbs.; bench type, 350 lbs.

Jefferson Machine Tool Co., 700 W. 4th St., Cincinnati, Ohio, are the makers.

FAST, ACCURATE GEAR-CHUCKING with the COTTA SPEED-CHUCK

Simply place the gear in the chuck and give it a slight turn to the right . . . the gear is gripped firmly and is exactly centered by hardened pitch-line pins bearing on accurately ground eccentric cams. Suitable for hole and face grinding operations, also boring and turning, where precision and production are important. To release the gear, give it a slight turn to the left. Successfully used in prominent war production plants. Made to specifications for spur, helical, and step or cluster gears. Send print for quotation.

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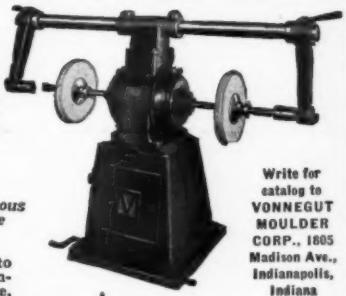
1712 HARLEM
ROCKFORD
ILLINOIS

(Above)

Spot grinding and buffing, preparatory to Brinnell hardness testing, is easily accomplished with this semi-special Marschke, accurately adjustable as to height and angle.

(Right)

Adjustable clearance buffer has overarm spindle support. Each buffing wheel is mounted on a sleeve which may be locked at any point along the extended spindle.



★ *"Marschkes, famous for Dependable Durability"*

Write for catalog to VONNEGUT MOULDER CORP., 1805 Madison Ave., Indianapolis, Indiana

MARSCHKE QUALITY GRINDERS AND BUFFERS

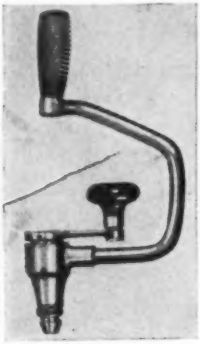
Special Bottleneck Breakers

Semi-special Marschkes . . . a service of the Marschke Engineering Dept. is the adaptation of standard machines to specific and unusual grinding and buffing requirements. Plus the Marschkes pictured are roll radius tool grinder, tank turret grinders, and standard machines with special purpose accessories. Guaranteed "Bottleneck Breakers."

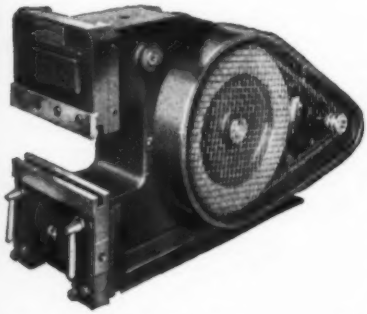
★ VONNEGUT MOULDER CORP. INDIANAPOLIS

Whitney-Jensen Catalog

Improvements in its line of aircraft tools, for punching, broaching, riveting, etc., are described in a new, 48 page catalog by Whitney Metal Tool Co., 115 Forbes St., Rockford, Ill.



Prominent among them are the G-742 Rivet-Puller, and No. 247 Whitney-Jensen bench-type press brake, illustrated. In the rivet-puller the firm has incorporated its special ballbearing feature, which decreases friction and is said to increase production speed. It is designed to make it quick and easy to head-up blind rivets, working from one side only, and without bucking bar.



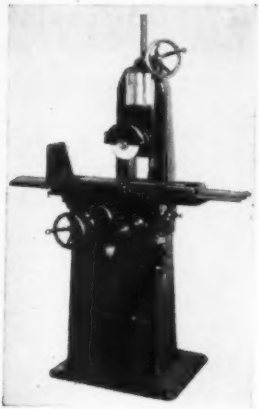
The press brake has 14-gage capacity, 72 strokes per minute, with 1 in stroke adjustment. Length of die is 18 in; throat depth, 6¼ in. It is equipped with 1 hp motor. Ram and die shoe are machined for standard dies.

The firm is prominent in the aircraft tool field, and its catalog lists a complete line of rivet squeezers, pullers, hand punches, bench punches, small tools, angle iron machinery, power squaring shears, toggle-action foot presses, bonding brakes, power punch presses, etc.

Gear & Wheel-Pullers

A puller for spoked wheels, pinions and sheaves Chaingrip, universal, because applicable wherever chains can be run, is announced by Armstrong-Bray & Co., 5364 Northwest Hwy., Chicago. It can be used for doing pulling jobs quickly and easily, in the most awkward places, regardless of whether object is close to or considerably removed from end of shaft. It consists of proof-tested, welded chains with malleable iron yokes and special, heat-treated screws.

Steelgrip, standard 2-arm gear and wheel pullers, also made by the firm, are said to be fast in action and easy to set up, by hooking over gear or wheel. They're rated to pull anything within arm's reach. Design is such that hooks cannot slip off. Arms are drop-forged steel, heat treated, with 2 positioning-holes. Steel forcing screw is hardened against upsetting or flaring. Swivel cap screws are also hardened steel.



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No. 2 6x20
HAND FEED

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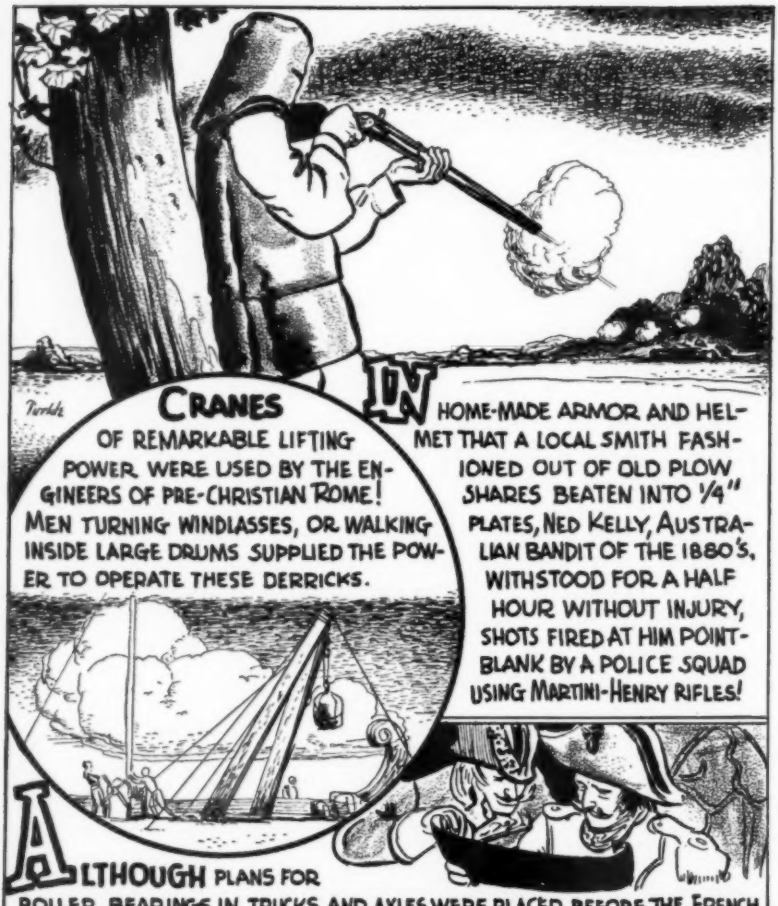
Mechanics Through the Ages


Parrish
CRANES OF REMARKABLE LIFTING POWER WERE USED BY THE ENGINEERS OF PRE-CHRISTIAN ROME! MEN TURNING WINDLASSES, OR WALKING INSIDE LARGE DRUMS SUPPLIED THE POWER TO OPERATE THESE DERRICKS.
IN HOME-MADE ARMOR AND HELMET THAT A LOCAL SMITH FASHIONED OUT OF OLD PLOW SHARES BEATEN INTO 1/4" PLATES, NED KELLY, AUSTRALIAN BANDIT OF THE 1880's, WITHSTOOD FOR A HALF HOUR WITHOUT INJURY, SHOTS FIRED AT HIM POINT-BLANK BY A POLICE SQUAD USING MARTINI-HENRY RIFLES!
ALTHOUGH PLANS FOR ROLLER BEARINGS IN TRUCKS AND AXLES WERE PLACED BEFORE THE FRENCH ARTILLERY COMMISSION AS EARLY AS 1795, NO PRACTICAL USE WAS MADE OF THE INNOVATION. WHAT HAPPENED TO THE DESIGNS IS STILL A MYSTERY.

Aircraft Manufacturer Mills Duralumin

at

3700 RPM

with this special cemented carbide tipped cutter

•

The newest method of milling aluminum alloys calls for running the cutter faster than most grinding wheels. Such high spindle speeds greatly increase the strain on the cutter. This makes it even more important that the cutter be properly designed and made.

The two step milling cutter shown above was manufactured by Carbide Fabricators to meet the requirements of an aircraft manufacturer. It is used for milling duralumin forgings and is run at 3700 revolutions per minute. It is nine and one half inches in diameter which gives it a surface speed of 8800 feet per minute. Feed is 59.2 inches per minute. This is one of many cutters manufactured by Carbide Fabricators to meet similar demands for cemented carbide tipped tools for heavy service.

There are many places in YOUR production where specially designed cemented carbide tipped tools would mean faster production . . . greater accuracy . . . longer tool life . . . lowered cost. For details on a particular job, send a set of blueprints to Carbide Fabricators. Complete information, including prices, will be furnished promptly.

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MFRS. OF STANDARD AND SPECIAL CEMENTED CARBIDE TIPPED TOOLS

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Eliminate heavy lifting. Cut handling costs. Table swivels and locks in any position. Can be varied 15½° by slight foot pressure, leaving operator's hands free. Engineered and built by tool engineers, experienced in production of special machines, dies, jigs and fixtures for exacting requirements.

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Ask for Bulletin 305;

At left: BALDOR Grinder No. 101, 1½ h.p., ball-bearing motor; 1725 r. p. m., 220 volts, 3- phase, 60 cy; **$90.00**
10" Aloxite wheels.
(Ask for Bulletin 307).

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LEVER - SCREW - HYDRAULIC
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Swing 16 inches
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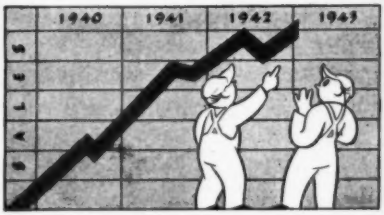

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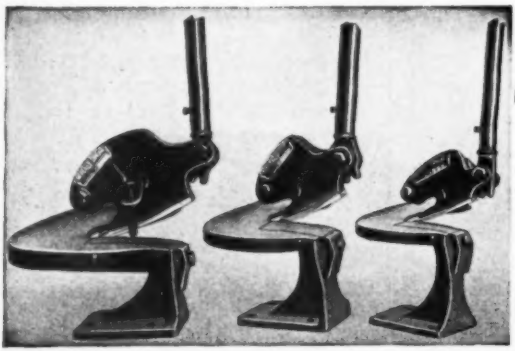

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Gear Specialists

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The Taylor Machine Co.

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CLEVELAND,
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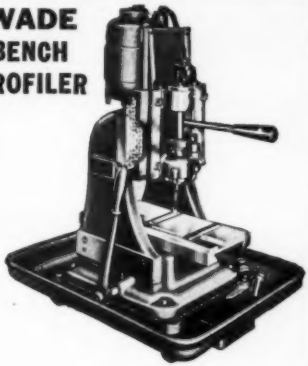
"TAYLOR-MADE"

WADE BENCH PROFILER



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Regular Type

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Included angle 60 degrees. Other angles made special to order.

Size	DIMENSIONS Dia. Body	Dia. Drill	Length Overall	PRICE PER DOZEN Semi-H. S. Steel Net	H. S. Steel Net
A-1	1/8"	3/64"	1¼"	$2.50	$7.20
C-2	13/64"	1/16"	1⅞"	3.00	7.20
D-1	15/64"	5/64"	2"	3.25	7.20
E-1	3/10"	3/32"	2⅛"	3.50	7.20
E-2	3/10"	1/8"	2⅛"	3.50	7.20
F-1	7/16"	5/32"	2¾"	4.50	10.80
F-2	7/16"	3/16"	2¾"	4.50	10.80
J-1	1/2"	7/32"	3"	.....	16.20
J-2	1/2"	9/32"	3"	.....	16.20
M-1	5/8"	7/32"	3¼"	.....	21.60
M-2	5/8"	9/32"	3¼"	.....	21.60
N-1	3/4"	1/4"	3½"	.....	28.80
N-2	3/4"	5/16"	3½"	.....	28.80

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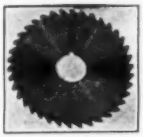
HIGH SPEED SLITTING SAWS



THESE SAWS ARE HOLLOW GROUND

Dia.	Width	Hole	Our Price Net Each High Speed
2½	1/32	⅞	$1.68
2½	3/64	⅞	1.68
2½	1/16	⅞	1.68
2½	3/32	⅞	1.68
2½	1/8	⅞	1.68
3	1/32	1	1.98
3	3/64	1	1.98
3	1/16	1	2.04
3	3/32	1	2.04
3	1/8	1	2.10
3	5/32	1	2.20
4	1/32	1	2.58
4	3/64	1	2.64
4	1/16	1	2.70
4	3/32	1	2.82
4	1/8	1	3.00
4	5/32	1	3.12
4	3/16	1	3.30
5	1/16	1	3.48
5	3/32	1	3.78
5	1/8	1—1¼	3.96
5	5/32	1—1¼	4.20
5	3/16	1—1¼	4.44
6	1/16	1	4.38
6	3/32	1	5.02
6	1/8	1—1¼	5.16
6	3/16	1—1¼	6.24
8	1/16	1	10.00
8	1/8	1—1¼	10.50
8	3/16	1—1¼	11.88

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Left Hand-Reverse Image, Right Hand Shown

Tool No. RH	LH	Shank Size
R-100	L-100	¼x¼x2
R-101	L-102	5/16x5/16x2¼
R-103	L-104	⅜x⅜x2½
R-105	L-106	7/16x7/16x3
R-107	L-108	½x½x3½

Right—200 Series

Tool No.	Shank Size
200	¼x¼x2
201	5/16x5/16x2¼
202	⅜x⅜x2½
203	7/16x7/16x3
204	½x½x3½

Below—300 Series

Tool No.	Shank Size
300	¼x¼x2
301	5/16x5/16x2½
302	⅜x⅜x2½
303	½x½x3½

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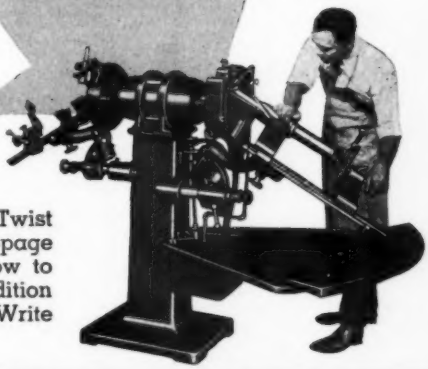

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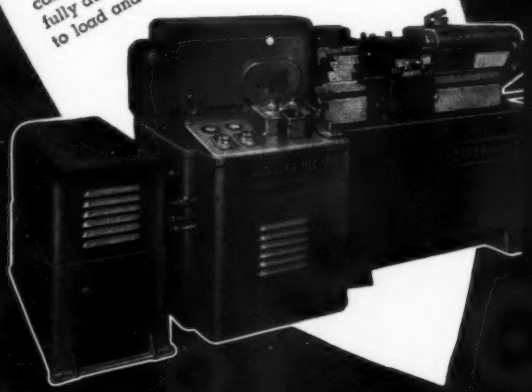

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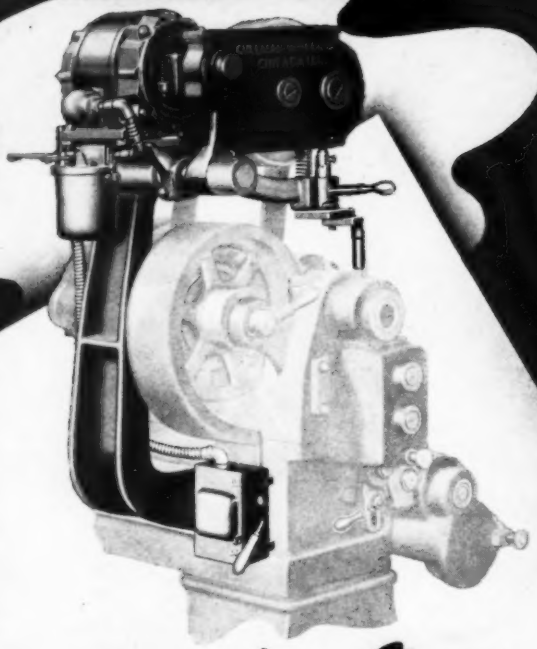

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